This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

KEY TO
MILNE'S
PROGRESSIVE
ARITHMETICS

Educ T 119.07.568

HARVARD
COLLEGE
LIBRARY

3 2044 097 006 738

KEY

TO THE

PROGRESSIVE ARITHMETICS

BOOKS II, III, AND COMPLETE

BY

WILLIAM J. MILNE, PH.D., LL.D.
PRESIDENT OF NEW YORK STATE NORMAL COLLEGE, ALBANY, N.Y.

NEW YORK .:. CINCINNATI .:. CHICAGO
AMERICAN BOOK COMPANY

Educ T 119.07.568

HARVARD COLLEGE LIBR.
GIFT OF THE
NEWTON FREE LIBRARY
AUG 9 1934

Copyright, 1907, by
WILLIAM J. MILNE.

KEY TO PROGRESSIVE ARITHMETICS.

E-P 1

PROGRESSIVE ARITHMETICS

KEY

TO

SECOND BOOK

Page 14

12. Cost of tickets = $.75 + $1.50 + $2 = $4.25.

13. At 3 for 10¢, 15 post cards cost as many times 10¢ as 3 is contained times in 15, that is, 5 × 10¢, or 50¢.
Expenses besides tickets = $2.25 + $.40 + $1 + $.50 + $.05 = $4.20.

14. Whole cost = $4.25 + $4.20 = $8.45.

15. ¾ of 1600 = 1200 ; 1200 × $1.50 = $1800.
⅕ of 1600 = 320 ; 320 × $.75 = $240.
1200 + 320 = 1520 ; 1600 − 1520 = 80 ; 80 × $1 = $80.
Receipts for fares = $1800 + $240 + $80 = $2120.

16. Receipts for staterooms = $110 + $400 + $90 + $8 + $50 + $24 = $682.

17. Receipts from cabin berths = 182 × $.50 = $91.

18. Receipts of dining room = 396 × $1.25 = $495.

19. Number of articles checked = 138 + 97 + 48 = 283.
Receipts of check room = 283 × $.05 = $14.15.

Page 15

20. Number of hundredweight in 29¾ tons = 29¾ × 20 = 595 ; 595 × $.20 = $119.
Number of hundredweight in 19½ tons = 19½ × 20 = 390 ; 390 × $.15 = $58.50.
Number of hundredweight in 51¼ tons = 51¼ × 20 = 1025 ; 1025 × $.12 = $123.
Number of hundredweight in 127½ tons = 127½ × 20 = 2550 ; 2550 × $.11 = $280.50.
Number of hundredweight in 283 tons = 283 × 20 = 5660 ; 5660 × $.10 = $566.
Number of hundredweight in 472 tons = 472 × 20 = 9440 ; 9440 × $.08 = $755.20.
Receipts for freight = $119 + $58.50 + $123 + $280.50 + $566 + $755.20 = $1902.20.

21. Total receipts = $2120 + $682 + $91 + $495 + $14.15 + $1902.20 = $5304.35.

22. Amount each man received for 1 trip = $580 ÷ 290 = $2.
Amount 135 men received for 1 trip = 135 × $2 = $270.

23. Cost of supplies = $\frac{3}{5}$ of \$495 = \$297.

24. Cost of coal = 35 × $4.90 = $171.50.

25. Cost of lubricating oil = 9 × $.67 = $6.03.

26. Cost of cotton waste = 8 × \$.09$\frac{1}{2}$ = \$.76.

27. In 1 hour 45 men received 45 × $.30 = $13.50.
In 9 hours 45 men received 9 × $13.50 = $121.50.

28. Total cost = $270 + $297 + $171.50 + $6.03 + $.76 + $121.50 = $866.79.

29. Rate per hour = 143 mi. ÷ 10 = 14$\frac{3}{10}$ mi.

30. Steamer takes as many hours to make return trip as 13 mi. is contained times in 143 mi., or 11 hr.; 11 hr. is 1 hr. longer than 10 hr.

Page 40

1. Number of words @3¢=22−10=12; 12×3¢=36¢; cost=50¢+36¢=86¢.

2. Number of words @2¢=22−10=12; 12×2¢=24¢; cost=30¢+24¢=54¢.

3. 86¢−54¢=32¢.

4. Number of words @3¢=15−10= 5; 5×3¢=15¢; cost=40¢+15¢=55¢.
Number of words @4¢=15−10= 5; 5×4¢=20¢; cost=60¢+20¢=80¢.
80¢−55¢=25¢.

5. Number of words @1¢=16−10= 6; 6×1¢= 6¢; cost=20¢+ 6¢=26¢.

6. Number of words @2¢=18−10= 8; 8×2¢=16¢; cost=25¢+16¢=41¢.
Number of words @1¢=18−10= 8; 8×1¢= 8¢; cost=25¢+ 8¢=33¢.

7. Number of words @2¢=22−10=12; 12×2¢=24¢; cost=25¢+24¢=49¢.
Number of words @1¢=22−10=12; 12×1¢=12¢; cost=25¢+12¢=37¢.

8. Number of words @2¢=24−10=14; 14×2¢=28¢; cost=25¢+28¢=53¢.
Number of words @1¢=24−10=14; 14×1¢=14¢; cost=25¢+14¢=39¢.

9. Number of words @2¢=26−10=16; 16×2¢=32¢; cost=25¢+32¢=57¢.
Number of words @1¢=26−10=16; 16×1¢=16¢; cost=25¢+16¢=41¢.

10. Number of words @2¢=17−10= 7; 7×2¢=14¢; cost=35¢+14¢=49¢.
Number of words @1¢=17−10= 7; 7×1¢= 7¢; cost=25¢+ 7¢=32¢.

11. Number of words @3¢=19−10= 9; 9×3¢=27¢; cost=40¢+27¢=67¢.
Number of words @2¢=19−10= 9; 9×2¢=18¢; cost=30¢+18¢=48¢.

12. Number of words @3¢=20−10=10; 10×3¢=30¢; cost=40¢+30¢=70¢.
Number of words @2¢=20−10=10; 10×2¢=20¢; cost=30¢+20¢=50¢.

13. Number of words @3¢=23−10=13; 13×3¢=39¢; cost=40¢+39¢=79¢.
Number of words @2¢=23−10=13; 13×2¢=26¢; cost=30¢+26¢=56¢.

14. Number of words @3¢=25−10=15; 15×3¢=45¢; cost=40¢+45¢=85¢.
Number of words @2¢=25−10=15; 15×2¢=30¢; cost=30¢+30¢=60¢.

15. Number of words @3¢=30−10=20; 20×3¢=60¢; cost=40¢+60¢=$1.
Number of words @2¢=30−10=20; 20×2¢=40¢; cost=30¢+40¢=70¢.

16. Number of words @3¢=32−10=22; 22×3¢=66¢; cost=40¢+66¢=$1.06.
Number of words @2¢=32−10=22; 22×2¢=44¢; cost=30¢+44¢=74¢.

17. Number of words @3¢=18−10= 8; 8×3¢=24¢; cost=50¢+24¢=74¢.
Number of words @2¢=18−10= 8; 8×2¢=16¢; cost=30¢+16¢=46¢.

18. Number of words @3¢=25−10=15; 15×3¢=45¢; cost=50¢+45¢=95¢.
Number of words @2¢=25−10=15; 15×2¢=30¢; cost=30¢+30¢=60¢.

19. Number of words @3¢=40−10=30; 30×3¢=90¢; cost=50¢+90¢=$1.40.
Number of words @2¢=40−10=30; 30×2¢=60¢; cost=30¢+60¢=90¢.

20. Number of words @3¢=60−10=50; 50×3¢=$1.50; cost=50¢+$1.50=$2.
Number of words @2¢=60−10=50; 50×2¢=$1; cost=30¢+$1=$1.30.

21. Number of words @4¢=19−10= 9; 9×4¢=36¢; cost=60¢+36¢=96¢.
Number of words @3¢=19−10= 9; 9×3¢=27¢; cost=40¢+27¢=67¢.

22. Number of words @4¢=30−10=20; 20×4¢=80¢; cost=60¢+80¢=$1.40.
Number of words @3¢=30−10=20; 20×3¢=60¢; cost=40¢+60¢=$1.

23. Number of words @4¢=22−10=12; 12×4¢=48¢; cost=60¢+48¢=$1.08.
Number of words @3¢=22−10=12; 12×3¢=36¢; cost=40¢+36¢=76¢.

24. Number of words @5¢=17−10= 7; 7×5¢=35¢; cost=75¢+35¢=$1.10.
Number of words @4¢=17−10= 7; 7×4¢=28¢; cost=60¢+28¢=88¢.

25. Number of words @5¢=21−10=11; 11×5¢=55¢; cost=75¢+55¢=$1.30.
Number of words @3¢=21−10=11; 11×3¢=33¢; cost=50¢+33¢=83¢.

26. Number of words @7¢=17−10= 7; 7×7¢=49¢; cost=$1+49¢ =$1.49.

27. Number of words @7¢=19−10= 9; 9×7¢=63¢; cost=$1+63¢ =$1.63.

28. Number of words @11¢=15−10=5; 5×11¢=55¢; cost=$1.25+55¢=$1.80.
Number of words @10¢=15−10=5; 5×10¢=50¢; cost=$1.05+50¢=$1.55.

Page 41

29. 15 words in message; by table, day rate New York to Chicago is 40 − 3.
Number of words @3¢ = 15 − 10 = 5; 5 × 3¢ = 15¢; cost =40¢+15¢=55¢.

30. By table, night rate New York to Chicago is 30−2.
Number of words @2¢ = 15 − 10 = 5; 5 × 2¢ = 10¢; cost=30¢+10¢=40¢.

31. Number of minutes @5¢ = 7 − 3 = 4; 4 × 5¢ = 20¢; 25¢ + 20¢ = 45¢.

32. From 7:55 P.M. to 8:03 P.M. is 8 min.
Number of minutes @ 15¢ = 8 − 3 = 5; 5 × 15¢ = 75¢; 50¢ + 75¢ = $1.25.

33. Number of minutes @ 25¢ = 8 − 3 = 5; 5 × 25¢ = $1.25; $1 + $1.25 = $2.25.

34. Number of minutes @ 5¢ = 10 − 3 = 7; 7 × 5¢ = 35¢; 20¢ + 35¢ = 55¢.

35. Number of minutes @ 10¢ = 11 − 3 = 8; 8 × 10¢ = 80¢; 40¢ + 80¢ = $1.20.

36. Number of minutes @ 10¢ = 12 − 3 = 9; 9 × 10¢ = 90¢; 50¢ + 90¢ = $1.40.

37. Number of minutes @ 15¢ = 6 − 3 = 3; 3 × 15¢ = 45¢; 60¢ + 45¢ = $1.05.

38. Number of minutes @ 25¢ = 8 − 3 = 5; 5 × 25¢ = $1.25; $1 + $1.25 = $2.25.

39. Number of minutes @ 40¢ = 5 − 3 = 2; 2 × 40¢ = 80¢; $1.50 + 80¢ = $2.30.

Page 89

11. $\frac{3}{5}$ of the distance = 171 mi.;
$\frac{1}{5}$ of the distance = $\frac{1}{3}$ of 171 mi. = 57 mi.;
$\frac{5}{5}$ of the distance = 5 × 57 mi. = 285 mi.

12. $\frac{4}{5}$ of his earnings = $816;
$\frac{1}{5}$ of his earnings = $\frac{1}{4}$ of $816 = $204;
$\frac{5}{5}$ of his earnings = 5 × $204 = $1020.

13. $\frac{7}{10}$ of live weight = 742 lb.;
$\frac{1}{10}$ of live weight = $\frac{1}{7}$ of 742 lb. = 106 lb.;
$\frac{10}{10}$ of live weight = 10 × 106 lb. = 1060 lb.

14. $\frac{3}{5}$ of the hawk's rate per hour = 90 mi.;
$\frac{1}{5}$ of the hawk's rate per hour = $\frac{1}{3}$ of 90 mi. = 30 mi.;
$\frac{5}{5}$ of the hawk's rate per hour = 5 × 30 mi. = 150 mi.

15. $\frac{3}{8}$ of the number of 8-page papers = 36,000;
$\frac{1}{8}$ of the number of 8-page papers = $\frac{1}{3}$ of 36,000 = 12,000;
$\frac{8}{8}$ of the number of 8-page papers = 8 × 12,000 = 96,000.

16. $\frac{5}{26}$ of the weight of the bell at Moscow = 30,000 lb.;
$\frac{1}{26}$ of the weight of the bell at Moscow = $\frac{1}{5}$ of 30,000 lb. = 6000 lb.;
$\frac{26}{26}$ of the weight of the bell at Moscow = 26 × 6000 lb. = 156,000 lb.

Page 90

1. Cubical contents of the first trunk = (36 × 20$\frac{1}{2}$ × 23) cu. in. = 16,974 cu. in.;
Cubical contents of the other trunk = (34 × 21 × 24) cu. in. = 17,136 cu. in.;
17,136 cu. in. − 16,974 cu. in. = 162 cu. in.

2. The first trunk weighs 63 lb. − 56 lb., or 7 lb. more than the second.
63 lb. ÷ 56 lb. = 1$\frac{1}{8}$; then the first trunk weighs 1$\frac{1}{8}$ times the second.

3. 2 suits cost 2 × $10.75 = $21.50 ; 3 shirtwaists cost 3 × $2.25 = $6.75.
Cost at this store = $21.50 + $6.50 + $6.75 + $35 = $69.75.
She pays 4 × $20 = $80, and receives in change $80 − $69.75 = $10.25.

4. At 2 for 5¢, 12 wash cloths cost as many times 5¢ as 2 is contained times in 12, that is, 6 × 5¢, or 30¢ ; $3.30 − $.30 = $3, the cost of the towels ; then the price of each towel = $3 ÷ 12 = $.25.

5. Shoes cost 2 × $3.50 = $7 ; cost of shoes and ties = $7 + $2.50 = $9.50.

6. At 3 pairs for $1, 12 pairs of stockings cost as many times $1 as 3 is contained times in 12, that is, 4 × $1, or $4 ; 12 handkerchiefs cost 12 × 12½¢ = $1.50 ; two stocks cost 2 × 49¢ = 98¢ ; 2 belts cost 2 × 35¢ = 70¢ ; 6¾ yd. of ribbon cost 6¾ × 16¢ = $1.08 ; the total cost at Hill's = $1.25 + $4 + $1.50 + $.98 + $.70 + $1.08 = $9.51.

7. The amount of additional purchases = $6 + $2.50 + $5.19 + $12 + $3 + $.65 + $18 + $6 + $30.67 = $84.01.

8. The total cost = $69.75 + $3.30 + $9.50 + $9.51 + $84.01 + $6.75 + $2.49 = $185.31.

Page 91

9. Since 2 lb. dates and 2 qt. peanuts make 2½ lb. stuffed dates, 10 lb. stuffed dates require as many times 2 lb. dates and 2 qt. peanuts as 2½ is contained times in 10, that is, 4 times 2 lb. dates and 2 qt. peanuts, or 8 lb. dates and 8 qt. peanuts.
8 lb. dates cost 8 × 15¢ = $1.20 ; 8 qt. or 1 pk., peanuts cost 72¢ ;
Elsa's contribution cost her $1.20 + $.72 + $.05 = $1.97.

10. 4 eggs = 4⁄12, or ⅓, doz. eggs ; ⅓ doz. eggs cost ⅓ × 24¢ = 8¢.
2 lb. sugar cost 2 × 8¢ = 16¢ ; 3 lb. walnuts cost 3 × 18¢ = 54¢.
The cost of the cream walnuts = 8¢ + 16¢ + 54¢ + 5¢ = 83¢.

11. Ferns for 12 baskets cost 12 × 10¢ = $1.20 ; $1.20 + 36¢ = $1.56, the total cost.
The cost of each filled basket = $1.56 ÷ 12 = $.13.

12. 1¼ yd. of toweling cost 1¼ × 40¢ = 50¢; 3 yd. of ribbon cost 3 × 10¢ = 30¢.
Each bag cost 50¢ + 30¢ = 80¢ ; the cost of all the bags = 5 × 80¢ = $4.

13. The stuffed dates sold for 10 × 40¢ = $4 ; the cream walnuts for 5 × 45¢ = $2.25 ; the fern baskets for 12 × 20¢ = $2.40, and the laundry bags for 5 × $1.25 = $6.25. Therefore, the total receipts = $4 + $2.25 + $2.40 + $6.25 + $7.65 + $9.35 + $37.15 = $69.05.

Page 95

23. 70.6 + 45.09 + 600.16 + 616 + .616 + .005 = 1332.471.

24. 456 + 400.056 + 9000.95 + 86.086 = 9943.092.

Page 100

33. The area of the roof = (40 × 20) sq. ft. = 800 sq. ft.
The weight of the roof = 800 × 9.25 lb. = 7400 lb.

34. Since 1 lb. of coal produces as much heat as 7.5 cu. ft. of gas, 1 ton, or 2000 lb., of coal gives as much heat as 2000 × 7.5 cu. ft., or 15,000 cu. ft. of gas.

35. The tank will hold (8 × 4 × 3) cu. ft., or 96 cu. ft. of water. 96 cu. ft. of water weigh 96 × 62.5 lb. = 6000 lb.

Page 103

38. The average clip = 330 lb. ÷ 88 = 3.75 lb.

39. Since 35 A. produced 259 T., 1 A. produced (259 ÷ 35) T. = 7.4 T.
Since 259 T. sold for $4014.50, the value per ton = $4014.50 ÷ 259 = $15.50; the value per acre = $4014.50 ÷ 35 = $114.70.

40. Since each person worked 6 × 8 hr., or 48 hr. per week, 2400 persons worked 2400 × 48 hr., or 115,200 hr. per week.
Therefore, the average wage per hour = $20,160 ÷ 115,200 = 17.5¢.

41. In 1 day 30 cows produced $(18{,}800 \div 30)$ lb. $= 626.666\frac{2}{3}$ lb.;
In 1 day 1 cow produced $(626.666\frac{2}{3} \div 30)$ lb. $= 20.888\frac{8}{9}$ lb.

42. In 1 day 30 cows produced $(656 \div 30)$ lb. $= 21.8\frac{2}{3}$ lb.;
In 1 day 1 cow produced $(21.8\frac{2}{3} \div 30)$lb. $= .72\frac{8}{9}$ lb.
The value of $.72\frac{8}{9}$ lb. of butter fat $= .72\frac{8}{9} \times 27$¢ = 19.68¢.

Page 108

2. $\$65 \div \$1.25 = \$65 \div \$\frac{5}{4} = 65 \times \frac{4}{5} = 52$, the number of articles.
3. $\$85 \div \$2.50 = \$85 \div \$\frac{5}{2} = 85 \times \frac{2}{5} = 34$, the number of articles.
4. $\$28 \div \$3.50 = \$28 \div \$\frac{7}{2} = 28 \times \frac{2}{7} = 8$, the number of articles.
5. $\$27 \div \$.37\frac{1}{2} = \$27 \div \$\frac{3}{8} = 27 \times \frac{8}{3} = 72$, the number of articles.
6. $\$98 \div \$.66\frac{2}{3} = \$98 \div \$\frac{2}{3} = 98 \times \frac{3}{2} = 147$, the number of articles.
7. $\$455 \div \$1.16\frac{2}{3} = \$455 \div \$\frac{7}{6} = 455 \times \frac{6}{7} = 390$, the number of articles.
8. $\$540 \div \$2.25 = \$540 \div \$\frac{9}{4} = 540 \times \frac{4}{9} = 240$, the number of articles.
9. $\$160 \div \$1.33\frac{1}{3} = \$160 \div \$\frac{4}{3} = 160 \times \frac{3}{4} = 120$, the number of articles.

Page 112

1. 8:37 A.M. = 60 min. – 37 min., or 23 min. before 9 A.M.; the time from 23 min. before 9 A.M. to 26 min. after 9 A.M. = 26 min. + 23 min. = 49 min.
The entire journey takes 15 min. + 49 min. + 35 min. = 99 min., or 1 hr. 39 min.

2. 2 stocks cost 2 × 37½¢ = 75¢; 6 collars cost 6 × 12½¢ = 75¢; 1 piece of ruching cost ⅜ × 24¢ = 9¢, and 6 pieces cost 6 × 9¢ = 54¢.

Eva paid at the neckwear counter 75¢ + 75¢ + 54¢ = $2.04.

She received in change $10 − $2.04 = $7.96.

3. The silk is worth 4⅞ × 72¢ = $3.51; $3.51 − $3.15 = $.36, the amount saved.

4. 2 boxes of blocks cost 2 × 35¢ = 70¢.

The cost in the toy department = 85¢ + 70¢ + $1.25 + 25¢ = $3.05.

5. Shakespeare's Works cost 16 × 35¢ = $5.60.

The cost in the book department = 42¢ + 95¢ + 95¢ + $1.50 + $5.60 = $9.42.

6. 4¾ yd. ribbon cost 4¾ × 36¢ = $1.71; 10 yd. baby ribbon cost 10 × 1½¢ = 15¢.

The cost at the ribbon counter = $1.71 + 15¢ = $1.86.

7. 1½ lb. nuts cost 1½ × 20¢ = 30¢; 2 lb. raisins cost 2 × 25¢ = 50¢; 3 qt. cranberries cost 3 × 9¢ = 27¢; an 8-lb. turkey cost 8 × 21½¢ = $1.72.

The cost in the grocery and meat department = 30¢ + 50¢ + 27¢ + $1.72 = $2.79.

8. Following is the bill, with data to be supplied:

(Place), Jan. 1, (Year).

Mrs. R. B. Crane,
(Address)

Bought of (Name of store) (Address)

1 doll			85		
2 boxes blocks	35¢		70		
1 doll carriage		1	25		
1 toy motor car			25		
1 "Alice in Wonderland"			42		
1 "Little Women"			95		
1 "Little Men"			95		
1 Bible		1	50		
1 set Shakespeare, 16 vol.	35¢	5	60		
4¾ yd. ribbon	36¢	1	71		
10 yd. baby ribbon	1½¢		15		
1½ lb. nuts	20¢		30		
2 lb. raisins	25¢		50		
3 qt. cranberries	9¢		27		
Turkey, 8 lb.	21½¢	1	72	17	12

Page 113

12. 6 chairs cost 6 × \$2.75 = \$16.50; 3 pairs of curtains cost 3 × \$1.75 = \$5.25.

The cost of furnishings for the dining room = \$18.60 + \$16 + \$16.50 + \$6.85 + \$12.25 + \$5.25 = \$75.45.

13. 20 yd. of matting cost 20 × 25¢ = \$5; 2 pairs of window curtains cost 2 × \$.95 = \$1.90; 2 chairs cost 2 × \$1.65 = \$3.30.

The cost of furnishings for the best bedroom = \$18 + \$2.75 + \$10.45 + \$4 + \$5 + \$1.90 + \$3.30 = \$45.40.

14. 17½ yd. of matting cost 17½ × 20¢ = \$3.50; 8 pictures cost 8 × 75¢ = \$6; 3 nursery posters cost 3 × 60¢ = \$1.80.

The cost of furnishings for the nursery = \$3.50 + \$12 + \$1.85 + \$3 + \$10 + \$3.45 + \$1.75 + \$6 + \$1.80 = \$43.35.

15. 3 porch chairs cost 3 × \$1.50 = \$4.50.

The cost of furnishings for the veranda = \$4.50 + \$2.70 + \$9 + \$10.75 = \$26.95.

16. The total cost = \$113.25 + \$208 + \$121.65 + \$75.45 + \$45.40 + \$43.35 + \$26.95 + \$49.85 + \$56.75 + \$15 + \$19.35 + \$25 = \$800.

Page 124

17. Since the width of 4 furrows is 4 × 9 in. = 36 in., or 3 ft., the distance traveled by a plow in overturning 1 acre, or 43,560 sq. ft., of land is (43,560 ÷ 3) ft., or 14,520 ft.; 14,520 ft. ÷ 5280 ft. = 2¾, the number of miles.

18. 4 acres = 4 × 43,560 sq. ft. = 174,240 sq. ft.; since the furrow is 12 in., or 1 ft., wide a man in plowing 4 acres must walk (174,240 ÷ 1) ft., or 174,240 ft.; 174,240 ft. ÷ 5280 ft. = 33, the number of miles.

19. Since 16 in. ÷ 8 in. = 2, and 10 in. ÷ 5 in. = 2, one large sheet contained 2 rows of small sheets, 2 in a row, that is, 2 × 2, or 4, small sheets; 5000 × 4 sheets = 20,000 sheets; 20,000 sheets ÷ 100 sheets = 200, the number of tablets.

Page 126

8. The area of each triangular part = ½ of (9 × 7) sq. ft. = 31½ sq. ft.;
The area of the roof = 5 × 31½ sq. ft. = 157½ sq. ft.

9. The area of each end = ½ of (12 × 8) sq. ft. = 48 sq. ft.; 48 sq. ft. ÷ 9 sq. ft. = 5⅓, the number of square yards.

The area of each side = (20 × 10) sq. ft. = 200 sq. ft.; 200 sq. ft. ÷ 9 sq. ft. = 22⅔, the number of square yards.

The area of the whole tent = (2 × 5⅓) sq. yd. + (2 × 22⅔) sq. yd. = 56 sq. yd.

10. The area of the floor = (20 × 12) sq. ft. = 240 sq. ft.

Page 129

13. The total time = 25 sec. + 54 sec. + 28 sec. + 17 sec. = 124 sec., or 2 min. 4 sec.

14. The length of chemical hose = 250 ft. + 250 ft. = 500 ft.
The length of steamer hose = (5 × 150) ft. + 500 ft. = 1250 ft.

15. 1 hr. 40 min. = 100 min. ; the first steamer pumped 100 × 900 gal. = 90,000 gal.

1 hr. 19 min. = 79 min.; the second steamer pumped 79 × 500 gal. = 39,500 gal.

$1\frac{1}{2}$ hr. = 90 min. ; the third steamer pumped 90 × 750 gal. = 67,500 gal.

The amount pumped = 90,000 gal. + 39,500 gal. + 67,500 gal. = 197,000 gal.

16. The number of 1000 gal. is 197 ; 197 × \$.10 = \$19.70, the value.

17. 1 ton = 2000 lb.; 1200 lb. = $\frac{1200}{2000}$ T. = $\frac{3}{5}$ T.; $\frac{3}{5}$ × \$18 = \$$10\frac{4}{5}$, or \$10.80, the expense for fuel.

18. The cost per year = 365 × 8¢ = \$29.20.

19. 9600 lb. ÷ 2000 lb. = 4.8, the number of tons.

Page 141

2. $\frac{\frac{5}{8}}{\frac{3}{4}}=\frac{5}{8}\div\frac{3}{4}=\frac{5}{8}\times\frac{4}{3}=\frac{5}{6}.$

3. $\frac{\frac{6}{7}}{\frac{2}{5}}=\frac{6}{7}\div\frac{2}{5}=\frac{6}{7}\times\frac{5}{2}=2\frac{1}{7}.$

4. $\frac{\frac{7}{8}}{\frac{7}{12}}=\frac{7}{8}\div\frac{7}{12}=\frac{7}{8}\times\frac{12}{7}=1\frac{1}{2}.$

5. $\frac{\frac{5}{6}}{\frac{15}{16}}=\frac{5}{6}\div\frac{15}{16}=\frac{5}{6}\times\frac{16}{15}=\frac{8}{9}.$

6. $\frac{8}{\frac{4}{5}}=8\div\frac{4}{5}=\frac{8}{1}\times\frac{5}{4}=10.$

7. $\frac{\frac{3}{8}}{6}=\frac{3}{8}\div 6=\frac{3}{8}\times\frac{1}{6}=\frac{1}{16}.$

8. $\frac{6}{3\frac{1}{3}}=6\div\frac{10}{3}=\frac{6}{1}\times\frac{3}{10}=1\frac{4}{5}.$

9. $\frac{5\frac{1}{2}}{4}=\frac{11}{2}\div 4=\frac{11}{2}\times\frac{1}{4}=1\frac{3}{8}.$

10. $\frac{1\frac{3}{4}}{1\frac{1}{2}}=\frac{7}{4}\div\frac{3}{2}=\frac{7}{4}\times\frac{2}{3}=1\frac{1}{6}.$

11. $\frac{2\frac{1}{2}}{3\frac{1}{3}}=\frac{5}{2}\div\frac{10}{3}=\frac{5}{2}\times\frac{3}{10}=\frac{3}{4}.$

12. $\frac{3\frac{3}{4}}{6\frac{2}{3}}=\frac{15}{4}\div\frac{20}{3}=\frac{15}{4}\times\frac{3}{20}=\frac{9}{16}.$

13. $\frac{5\frac{1}{5}}{5\frac{4}{7}}=\frac{26}{5}\div\frac{39}{7}=\frac{26}{5}\times\frac{7}{39}=\frac{14}{15}.$

14. $\frac{4\frac{7}{8}}{19\frac{1}{2}}=\frac{39}{8}\div\frac{39}{2}=\frac{39}{8}\times\frac{2}{39}=\frac{1}{4}.$

15. $\frac{8\frac{1}{3}}{33\frac{1}{3}}=\frac{25}{3}\div\frac{100}{3}=\frac{25}{3}\times\frac{3}{100}=\frac{1}{4}.$

16. $\frac{6\frac{1}{4}}{37\frac{1}{2}}=\frac{25}{4}\div\frac{75}{2}=\frac{25}{4}\times\frac{2}{75}=\frac{1}{6}.$

17. $\frac{62\frac{1}{2}}{66\frac{2}{3}}=\frac{125}{2}\div\frac{200}{3}=\frac{125}{2}\times\frac{3}{200}=\frac{15}{16}.$

18. $\frac{3\frac{1}{4}+\frac{2}{3}}{6\frac{3}{4}-\frac{7}{8}}=3\frac{1}{4}+\frac{2}{3}$ divided by $6\frac{3}{4}-\frac{7}{8}=3\frac{11}{12}\div 5\frac{7}{8}=\frac{47}{12}\div\frac{47}{8}=\frac{47}{12}\times\frac{8}{47}=\frac{2}{3}.$

19. $\frac{\frac{2}{3} \text{ of } 8}{6\frac{2}{3}} = \frac{2}{3} \times 8 \text{ divided by } \frac{20}{3} = \frac{2}{3} \times 8 \times \frac{3}{20} = \frac{4}{5}.$

20. $\frac{2\frac{9}{10}}{\frac{1}{2} \text{ of } \frac{4}{5}} = \frac{29}{10} \text{ divided by } \frac{1}{2} \times \frac{4}{5} = \frac{29}{10} \times \frac{2}{1} \times \frac{5}{4} = 7\frac{1}{4}.$

21. $\frac{7}{8} \text{ of } \frac{5}{4\frac{3}{8}} = \frac{7}{8} \times \left(5 \div \frac{35}{8}\right) = \frac{7}{8} \times \frac{5}{1} \times \frac{8}{35} = 1.$

2. $\frac{80}{144} = \frac{5}{9};\ \frac{\frac{5}{12}}{\frac{2}{3}} = \frac{5}{12} \div \frac{2}{3} = \frac{5}{12} \times \frac{3}{2} = \frac{5}{8};\ \frac{\frac{3}{8}}{12} = \frac{3}{8} \div 12 = \frac{3}{8} \times \frac{1}{12} = \frac{1}{32}.$

Page 142

8. $\frac{\frac{3}{8}}{\frac{5}{6}} = \frac{3}{8} \div \frac{5}{6} = \frac{3}{8} \times \frac{6}{5} = \frac{9}{20}.$

9. $\frac{\frac{4}{5}}{\frac{8}{9}} = \frac{4}{5} \div \frac{8}{9} = \frac{4}{5} \times \frac{9}{8} = \frac{9}{10}.$

10. $\frac{\frac{5}{8}}{1\frac{5}{16}} = \frac{5}{8} \div \frac{15}{16} = \frac{5}{8} \times \frac{16}{15} = \frac{2}{3}.$

11. $\frac{2\frac{1}{2}}{25} = \frac{5}{2} \div 25 = \frac{5}{2} \times \frac{1}{25} = \frac{1}{10}.$

12. $\frac{6\frac{1}{4}}{75} = \frac{25}{4} \div 75 = \frac{25}{4} \times \frac{1}{75} = \frac{1}{12}.$

13. $\frac{6\frac{2}{3}}{8\frac{1}{3}} = \frac{20}{3} \div \frac{25}{3} = \frac{20}{3} \times \frac{3}{25} = \frac{4}{5}.$

14. $\frac{3\frac{3}{4}}{5\frac{5}{8}} = \frac{15}{4} \div \frac{45}{8} = \frac{15}{4} \times \frac{8}{45} = \frac{2}{3}.$

15. $\frac{6\frac{4}{5}}{12\frac{3}{4}} = \frac{34}{5} \div \frac{51}{4} = \frac{34}{5} \times \frac{4}{51} = \frac{8}{15}.$

16. $\frac{9\frac{3}{8}}{31\frac{1}{4}} = \frac{75}{8} \div \frac{125}{4} = \frac{75}{8} \times \frac{4}{125} = \frac{3}{10}.$

17. $\frac{37\frac{1}{2}}{66\frac{2}{3}} = \frac{75}{2} \div \frac{200}{3} = \frac{75}{2} \times \frac{3}{200} = \frac{9}{16}.$

18. The part of an acre that will yield $12\frac{1}{2}$ bu. =

$$\frac{12\frac{1}{2}}{18\frac{3}{4}} = \left(\frac{25}{2} \div \frac{75}{4}\right) = \left(\frac{25}{2} \times \frac{4}{75}\right) = \frac{2}{3}\text{ A.}$$

19. The part of the cream that was butter fat = $\frac{6\frac{2}{3}}{26\frac{2}{3}} = \frac{20}{3} \div \frac{80}{3} = \frac{20}{3} \times \frac{3}{80} = \frac{1}{4}.$

20. The part that the cost was of the selling price =

$$\frac{87\frac{1}{2}}{218\frac{3}{4}} = \frac{175}{2} \div \frac{875}{4} = \frac{175}{2} \times \frac{4}{875} = \frac{2}{5}.$$

21. The part that the length of the forefinger is of the whole height =

$$\frac{8\frac{1}{3}}{150} = \frac{25}{3} \div 150 = \frac{25}{3} \times \frac{1}{150} = \frac{1}{18}.$$

22. The fractional part of the park that the lake occupies =

$$\frac{108\frac{7}{15}}{325\frac{2}{5}} = \frac{1627}{15} \div \frac{5}{1627} = \frac{1}{3}.$$

Page 143

1. $\frac{9}{10} \div \frac{3}{4} = 1\frac{1}{5}$; that is, $\frac{9}{10}$ is $1\frac{1}{5}$ times $\frac{3}{4}$.

2. $\frac{5}{12} \div \frac{2}{3} = \frac{5}{8}$; that is, $\frac{5}{12}$ is $\frac{5}{8}$ of $\frac{2}{3}$.

3. $\frac{15}{16} \div \frac{5}{6} = 1\frac{1}{8}$; that is, $\frac{15}{16}$ is $1\frac{1}{8}$ times $\frac{5}{6}$.

4. $\frac{11}{18} \div \frac{2}{3} = \frac{11}{12}$; that is, $\frac{11}{18}$ is $\frac{11}{12}$ of $\frac{2}{3}$.

5. $24 \div 6\frac{2}{3} = 3\frac{3}{5}$; that is, 24 is $3\frac{3}{5}$ times $6\frac{2}{3}$.

6. $88 \div 5\frac{3}{5} = 15\frac{5}{7}$; that is, 88 is $15\frac{5}{7}$ times $5\frac{3}{5}$.

7. $8\frac{1}{4} \div 66 = \frac{1}{8}$; that is, $8\frac{1}{4}$ is $\frac{1}{8}$ of 66.

8. $6\frac{1}{6} \div 74 = \frac{1}{12}$; that is, $6\frac{1}{6}$ is $\frac{1}{12}$ of 74.

9. $87\frac{1}{2} \div 8\frac{1}{3} = 10\frac{1}{2}$; that is, $87\frac{1}{2}$ is $10\frac{1}{2}$ times $8\frac{1}{3}$.

10. $15\frac{3}{4} \div 94\frac{1}{2} = \frac{1}{6}$; that is, $15\frac{3}{4}$ is $\frac{1}{6}$ of $94\frac{1}{2}$.

11. $46\frac{2}{3} \div 6\frac{5}{12} = 7\frac{3}{11}$; that is, $46\frac{2}{3}$ is $7\frac{3}{11}$ times $6\frac{5}{12}$.

12. $91\frac{1}{3} \div 22\frac{5}{6} = 4$; that is, $91\frac{1}{3}$ is 4 times $22\frac{5}{6}$.

13. $\frac{2}{3} \div \frac{11}{12} = \frac{8}{11}$; that is, $\frac{2}{3}$ is $\frac{8}{11}$ of $\frac{11}{12}$; since $\frac{11}{12}$ bbl. of flour makes 231 loaves, $\frac{2}{3}$ bbl. will make $\frac{8}{11}$ of 231 loaves, or 168 loaves.

14. $7\frac{1}{2} \div 22\frac{1}{2} = \frac{1}{3}$; that is, $7\frac{1}{2}$ is $\frac{1}{3}$ of $22\frac{1}{2}$; since \$$22\frac{1}{2}$ can buy 18 bbl. of cabbages, \$$7\frac{1}{2}$ can buy $\frac{1}{3}$ of 18 bbl., or 6 bbl.

Page 144

15. $3\frac{3}{4} \div \frac{3}{5} = \frac{25}{4}$; that is, $3\frac{3}{4}$ is $\frac{25}{4}$ times $\frac{3}{5}$; since she receives \$$\frac{3}{5}$ for picking 40 qt. of strawberries, to earn \$$3\frac{3}{4}$ she must pick $\frac{25}{4} \times 40$ qt., or 250 qt.

16. $86\frac{1}{4} \div 6\frac{2}{3} = \frac{207}{16}$; that is, $86\frac{1}{4}$ is $\frac{207}{16}$ times $6\frac{2}{3}$; since $6\frac{2}{3}$ T. of hay were raised on 4 A., $86\frac{1}{4}$ T. were raised on $\frac{207}{16} \times 4$ A., or $51\frac{3}{4}$ A.

17. $7\frac{7}{8} \div 26\frac{1}{4} = \frac{3}{10}$; that is, $7\frac{7}{8}$ is $\frac{3}{10}$ of $26\frac{1}{4}$; since an automobile runs 8 mi. while a train runs $26\frac{1}{4}$ mi., the distance traveled by the automobile while the train goes $7\frac{7}{8}$ mi. is $\frac{3}{10}$ of 8 mi., or $2\frac{2}{5}$ mi.

18. $1\frac{1}{5} \div 13\frac{1}{2} = \frac{4}{45}$; that is, $1\frac{1}{5}$ is $\frac{4}{45}$ of $13\frac{1}{2}$; since \$$13\frac{1}{2}$ pays for transporting 90 cans of milk, \$$1\frac{1}{5}$ pays for transporting $\frac{4}{45}$ of 90 cans, or 8 cans.

19. $28\frac{4}{5} \div 4\frac{1}{2} = \frac{32}{5}$; that is, $28\frac{4}{5}$ is $\frac{32}{5}$ times $4\frac{1}{2}$; since $4\frac{1}{2}$ A. of land require $\frac{3}{4}$ bu. of seed, $28\frac{4}{5}$ A. require $\frac{32}{5} \times 3\frac{3}{4}$ bu., or 24 bu.

20. $427\frac{1}{2} \div 31\frac{2}{3} = \frac{27}{2}$; that is, $427\frac{1}{2}$ is $\frac{27}{2}$ times $31\frac{2}{3}$; since $31\frac{2}{3}$ bbl. of apples were the yield of 10 trees, $427\frac{1}{2}$ bbl. were the yield of $\frac{27}{2} \times 10$ trees, or 135 trees.

2. As many tons of ore can be mined for \$$61\frac{1}{2}$ as \$$\frac{3}{5}$, the cost of mining one ton, is contained times in \$$61\frac{1}{2}$; that is, \$$61\frac{1}{2} \div$ \$$\frac{3}{5}$, or $102\frac{1}{2}$ T.

The cost of crushing $102\frac{1}{2}$ T. of ore is $102\frac{1}{2} \times$ \$$\frac{9}{10}$, or \$$92\frac{1}{4}$.

3. $60 \div 7 = \frac{60}{7}$; that is, 60 is $\frac{60}{7}$ times 7; since the train averages $6\frac{1}{8}$ mi. every 7 min., in 1 hr., or 60 min., it will go $\frac{60}{7} \times 6\frac{1}{8}$ mi., or $52\frac{1}{2}$ mi.

$49 \div 6\frac{1}{8} = 8$; that is, 49 is 8 times $6\frac{1}{8}$; since the train averages $6\frac{1}{8}$ mi. every 7 min., it will go 49 mi. in 8×7 min., or 56 min.

4. Since $3\frac{1}{2}$ bbl. of oil are equivalent to 1 T. of coal, 910,938 bbl. are equivalent to as many tons as $3\frac{1}{2}$ is contained times in 910,938; that is, $910{,}938 \div 3\frac{1}{2} = 260{,}268$, the number of tons.

5. $16 \times \frac{3}{4}$¢ = 12¢, her earnings per day on old plants.
$7\frac{1}{2} \times \frac{3}{4}$¢ = $5\frac{5}{8}$¢, her earnings per day on young plants.
Therefore she earns more on old than on young plants by 12¢ − $5\frac{5}{8}$¢ = $6\frac{3}{8}$¢.

Page 145

6. $6\frac{1}{2} \times \$\frac{1}{2} = \$3\frac{1}{4}$, the cost of the cloth for Elsie's dress.
$11\frac{1}{4} \times \$\frac{3}{5} = \$6\frac{3}{4}$, the cost of the cloth for her mother's dress.
Then the cloth for Elsie's dress cost $\$6\frac{3}{4} - \$3\frac{1}{4}$, or $\$3\frac{1}{2}$ less than the cloth for her mother's.

7. At $\$\frac{1}{2}$ per dozen, 90, or $7\frac{1}{2}$ doz. cocoanuts cost $7\frac{1}{2} \times \$\frac{1}{2} = \$3\frac{3}{4}$; at $\$\frac{1}{20}$ apiece, 90 cocoanuts sold for $90 \times \$\frac{1}{20} = \$4\frac{1}{2}$; then the gain $= \$4\frac{1}{2} - \$3\frac{3}{4} = \$\frac{3}{4}$.

8. $3\frac{1}{3}$ doz. bananas sold for $3\frac{1}{3} \times \$\frac{3}{20}$, or $\$\frac{1}{2}$; $6\frac{1}{4}$ doz. sold for $6\frac{1}{4} \times \$\frac{1}{5}$, or $\$1\frac{1}{4}$; all the bananas sold for $\$\frac{1}{2} + \$1\frac{1}{4}$, or $\$1\frac{3}{4}$; then, the gain $= \$1\frac{3}{4} - \$1\frac{1}{4} = \$\frac{1}{2}$.

9. 56 is $\frac{56}{224}$, or $\frac{1}{4}$, of 224; since 224 lb. of salt cost $\$1\frac{3}{5}$, 56 lb. cost $\frac{1}{4}$ of $\$1\frac{3}{5}$, or $\$\frac{2}{5}$.

10. $1\frac{2}{5} \div \frac{1}{10} = 14$; that is, $1\frac{2}{5}$ is 14 times $\frac{1}{10}$; since 16 lb. of salt cost $\$\frac{1}{10}$, the amount that can be bought for $\$1\frac{2}{5}$ is 14×16 lb., or 224 lb.

11. $\$43{,}333\frac{1}{3} \div \$65{,}000 = \frac{2}{3}$; that is, $\$43{,}333\frac{1}{3}$ is $\frac{2}{3}$ of $65,000.

12. Mr. Thayer sold Mr. Hall $\frac{5}{8}$ of $\frac{3}{4}$ of a section; since Mr. Hall gave $\frac{2}{5}$ of his part to his son, he gave him $\frac{2}{5}$ of $\frac{5}{8}$ of $\frac{3}{4}$ of a section, or $\frac{3}{16}$ of a section. $\frac{3}{16}$ of a section is $\frac{3}{16}$ of 640 A., or 120 A.

13. At 2640 ties per mile, $9\frac{3}{16} \times 2640$ ties, or 24,255 ties, were used.
At $\$\frac{4}{5}$ each, 24,255 ties cost $24{,}255 \times \$\frac{4}{5}$, or $19,404.

14. Since $57\frac{1}{6}$ bu. of seed are required for $24\frac{1}{2}$ A., as many bushels are required for 1 A. as $24\frac{1}{2}$ is contained times in $57\frac{1}{6}$, that is, $57\frac{1}{6} \div 24\frac{1}{2}$, or $2\frac{1}{3}$, the number of bushels in South Carolina.

Since in Japan $\frac{2}{3}$ A. requires $\frac{5}{6}$ bu. of seed, $\frac{1}{3}$ A. requires $\frac{1}{2}$ of $\frac{5}{6}$ bu., or $\frac{5}{12}$ bu., and $\frac{3}{3}$, or 1 A., requires $3 \times \frac{5}{12}$ bu., or $1\frac{1}{4}$ bu.

South Carolina uses $2\frac{1}{3}$ bu. − $1\frac{1}{4}$ bu., or $1\frac{1}{12}$ bu., more per acre.

15. The cubical contents of the elevator $= (7\frac{1}{8} \times 7\frac{1}{8} \times 80)$ cu. ft. $= \frac{16245}{4}$ cu. ft. Since each bushel of grain occupied $1\frac{1}{4}$ cu. ft. of space, the elevator held as many bushels as $1\frac{1}{4}$ is contained times in $\frac{16245}{4}$; that is, $\frac{16245}{4} \div 1\frac{1}{4}$, or 3249 bu.

16. The area of the fence = ($45 \times 1\frac{7}{8}$) sq. yd. = $\frac{675}{8}$ sq. yd.; since $18\frac{3}{4}$ lb. of paint for the first coat covered $\frac{675}{8}$ sq. yd., 1 lb. covered as many square yards as $18\frac{3}{4}$ is contained times in $\frac{675}{8}$; that is, $\frac{675}{8} \div 18\frac{3}{4}$, or $4\frac{1}{2}$ sq. yd.

Since $13\frac{1}{2}$ lb. of paint for the second coat covered $\frac{675}{8}$ sq. yd., 1 lb. covered as many square yards as $13\frac{1}{2}$ is contained times in $\frac{675}{8}$; that is, $\frac{675}{8} \div 13\frac{1}{2}$, or $6\frac{1}{4}$ sq. yd.

Page 151

30. The length of the Southern Ry. = 8667.5 mi. – 1468.82 mi. = 7198.68 mi.

The length of the Southern Ry. and the B. & O. combined = 8667.5 mi. + 2973.53 mi. = 11,641.03 mi., and the length of the B. & O. = 11,641.03 mi. – 7198.68 mi. = 4442.35 mi.

Page 160

1. \$2377.35 ÷ 4.5 = \$528.30, the income per acre.

2. 5738.35 lb. ÷ 2.15 lb. = 2669, the number of quarts.

3. \$6983.06 ÷ 21.7 = \$321.80, the cost per mile.

4. 175.5 bbl. × 25 = 4387.5 bbl.; 4387.5 × 70¢ = \$3071.25, the cost.

5. \$3.51 ÷ 6.75 = \$.52, the cost per mile.

6. 207.35 gal. ÷ 3.77 gal. = 55, the number of acres.

7. 196,880 cu. ft. ÷ .92 = 214,000 cu. ft.

8. The cost of living in 1860, for 5 persons = 5 × \$115.191 = \$575.955;
The cost of living in 1904, for 5 persons = 5 × \$97.192 = \$485.96;
Hence, it cost \$575.955 – \$485.96, or \$89.995, less in 1904 than in 1860.

9. The distance from Albion to Carthage = 89.885 mi. + 101.215 mi. = 191.1 mi.;
At \$.13 per mile the cost of the coal = 191.1 × \$.13 = \$24.843.

10. The total length of track = 128.18 mi. + 24.28 mi. = 152.46 mi.;
\$334,421.01 ÷ 152.46 = \$2193.50, the operating expenses per mile.

Page 161

1. 1 + 750 + 2700 = 3451, the number of bees.

2. 140 × \$4.95 = \$693, the amount he invested in bees.

3. 18,000 honey boxes cost 18 × \$3 = \$54; 280 supers cost 280 × 25¢ = \$70; 780 shipping cases cost 780 × 16¢ = \$124.80; 100 lb. comb foundation cost 100 × 52¢ = \$52. Then the cost of these supplies = \$54 + \$70 + \$124.80 + \$52 = \$300.80.

4. The cost of labor for 1 mo. = \$10 + \$10 + \$30 + \$50 = \$100;
The cost of labor for 5 mo. = 5 × \$100 = \$500.

5. The amount of clover honey = $\frac{5}{8}$ of 15,520 lb., or 9700 lb.
The amount of buckwheat honey = 15,520 lb. − 9700 lb. = 5820 lb.

6. At $12\frac{1}{2}$¢ per pound the clover honey sold for 9700 × $12\frac{1}{2}$¢ = $1212.50.
At $10\frac{1}{2}$¢ per pound the buckwheat honey sold for 5820 × $10\frac{1}{2}$¢ = $611.10.
$1212.50 + $611.10 = $1823.60, the total amount received.

7. 125,000,000 × 9¢ = $11,250,000, the total value of honey.

Page 162

8. Seed peas cost 2 × $12\frac{1}{2}$¢ = 25¢; tomato seed cost 2 × 5¢ = 10¢; seed for lima beans cost $1\frac{1}{2}$ × 10¢ = 15¢; seed for string beans cost 2 × 15¢ = 30¢; lettuce seed cost 3 × 5¢ = 15¢; seed sweet corn cost $2\frac{1}{2}$ × 12¢ = 30¢. Then, the total cost of seed = 10¢ + 25¢ + 10¢ + 15¢ + 30¢ + 15¢ + 30¢ = $1.35.

9. 24 × 5¢ = $1.20, the proceeds from beets.

10. $5\frac{1}{2}$ × 40¢ = $2.20, the proceeds from peas.

11. $6\frac{3}{4}$ bu. = $6\frac{3}{4}$ × 4 pk., or 27 pk.; 27 × 20¢ = $5.40, the proceeds from tomatoes.

12. $1\frac{1}{2}$ bu. = 6 pk. = 48 qt.; 48 × 8¢ = $3.84, the proceeds from lima beans.

13. 43 × 11¢ = $4.73, the proceeds from currants.

14. 21 × 12¢ = $2.52, the proceeds from gooseberries.

15. $\frac{1}{2}$ of 160 heads = 80 heads; 80 × 5¢ = $4, the sum received for $\frac{1}{2}$ of the crop.

$\frac{3}{8}$ of 160 heads = 60 heads; 60 × 6¢ = $3.60, the sum received for $\frac{3}{8}$ of the crop.

80 heads + 60 heads = 140 heads; 160 heads − 140 heads = 20 heads, the rest. At 2 heads for 15¢, 20 heads sold for as many times 15¢ as 2 is contained times in 20, or 10; that is, they sold for 10 × 15¢ = $1.50.

$4 + $3.60 + $1.50 = $9.10, the sum received for lettuce.

16. 2 bu. 1 pk. = 9 pk. = 72 qt.; $\frac{1}{3}$ of 72 qt. = 24 qt., the first lot; 24 × 15¢ = $3.60, the amount the first lot brought; 72 qt. − 24 qt. = 48 qt., the second lot; 48 × 10¢ = $4.80, the amount the second lot brought.

Then, the amount received for string beans = $3.60 + $4.80 = $8.40.

Page 163

17. 132, or 11 doz., ears brought 11 × 20¢ = $2.20; 330 ears − 132 ears = 198 ears, the late crop; 198, or $16\frac{1}{2}$ doz., ears brought $16\frac{1}{2}$ × 16¢ = $2.64. Hence, the corn brought $2.20 + $2.64 = $4.84.

18. 90 plants − 24 plants = 66, or $5\frac{1}{2}$ doz., plants; $5\frac{1}{2}$ × 30¢ = $1.65, the sum the tomato plants brought.

19. The total receipts for vegetables and plants = \$1.20 + \$2.20 + \$5.40 + \$3.84 + \$4.73 + \$2.52 + \$9.10 + \$8.40 + \$4.84 + \$1.65 = \$43.88.

20. 40 × 6 flowers = 240 flowers; 240, or 20 doz., flowers brought 20 × 25¢ = \$5.

21. 18 days in July + 31 days in August + 30 days in September + 6 days in October = 85 days; 85 × 36 stems = 3060 stems, number picked during season.

22. 3060 stems ÷ 36 stems = 85, the number of bunches; 85 × 18¢ = \$15.30, the proceeds from sweet peas.

23. 672, or 56 doz., dahlias sold for 56 × 20¢ = \$11.20.

24. The total receipts from flowers = \$5 + \$15.30 + \$11.20 = \$31.50; from the whole garden = \$43.88 + \$31.50 = \$75.38.

25. Flower seed cost 4 × 10¢ = 40¢; 8, or $\frac{2}{3}$ doz., dahlia bulbs cost $\frac{2}{3}$ × \$2.85 = \$1.90; the total cost = \$1.35 + 40¢ + \$1.90 + \$4.27 + \$8.50 = \$16.42.

26. \$75.38 − \$16.42 = \$58.96, the total profits; \$58.96 ÷ 4 = \$14.74, each child's share.

Page 164

27. 700 car loads − 592 car loads, or 108 car loads, more this year.

28. 12,600,000 cantaloupes ÷ 700 = 18,000 cantaloupes per car.

29. 12,600,000 cantaloupes ÷ 45 cantaloupes = 280,000, the number of crates.

30. 18,000 cantaloupes ÷ 45 cantaloupes = 400, the number of crates per car.

31. 150 × 30 cantaloupes = 4500 cantaloupes, large size; 150 × 45 cantaloupes = 6750 cantaloupes, standard size; 150 × 64 cantaloupes = 9600 cantaloupes, small size; the number of cantaloupes in the car = 4500 + 6750 + 9600 = 20,850.

32. 450 × 45 cantaloupes = 20,250 cantaloupes, standard size; 20,850 is 600 more than 20,250.

33. 9 days in August + 31 days in July + 30 days in June + 31 days in May = 101 days, including May 1; hence Aug. 9 is 100 days *after* May 1, and he must have planted on May 1.

34. .8 × 5000 cantaloupes = 4000 cantaloupes, standard size.

.07 × 5000 cantaloupes = 350 cantaloupes, large size.

4000 cantaloupes + 350 cantaloupes = 4350 cantaloupes; 5000 cantaloupes − 4350 cantaloupes = 650 cantaloupes, small size.

35. 467 crates cost 467 × \$1.10 = \$513.70; the total cost = \$513.70 + \$226.50 = \$740.20. 146 crates brought 146 × \$2.25 = \$328.50; 181 crates brought 181 × \$2.10 = \$380.10; 140 crates brought 140 × \$2.45 = \$343; the total amount received = \$328.50 + \$380.10 + \$343 = \$1051.60. Then, the gain = \$1051.60 − \$740.20 = \$311.40.

36. 23 cantaloupes sold for 23 × 10¢ = $2.30; 18 cantaloupes sold for 18 × 8¢ = $1.44; 23 cantaloupes + 18 cantaloupes = 41 cantaloupes; 45 cantaloupes − 41 cantaloupes = 4 cantaloupes; 4 cantaloupes sold for 4 × 6¢ = 24¢; the total amount he received = $2.30 + $1.44 + 24¢ = $3.98; $3.98 − $2.50 = $1.48, his gain.

37. The number of half cantaloupes = 2 × 30 = 60; 60 × 30¢ = $18, the amount received for them; $18 − $5 = $13, the profit.

Page 165

38. The area = (52 × 20) sq. rd. = 1040 sq. rd.; 1040 sq. rd. ÷ 160 sq. rd. = $6\frac{1}{2}$, the number of acres.

39. The quantity of seed = $6\frac{1}{2} \times 2$ bu. = 13 bu.; its cost = 13 × $1.02 = $13.26.

40. $6\frac{1}{2} \times \$1.90 = \$12.35$, the cost of preparing the ground.

41. $6\frac{1}{2} \times \$1.10 = \$7.15$, the cost of planting.

42. $6\frac{1}{2} \times \$4.72 = \$30.68$, the cost of cultivating and caring for the crop.

43. $6\frac{1}{2} \times \$16.50 = \$107.25$, the cost of harvesting.

44. The total expense = $13.26 + $12.35 + $7.15 + $30.68 + $107.25 = $170.69.

The expense per acre = $\$170.69 \div 6\frac{1}{2} = \$26.26$.

45. $354\frac{1}{4}$ bu. ÷ $6\frac{1}{2}$ = $54\frac{1}{2}$ bu., the average yield per acre.

46. $354\frac{1}{4} \times 96¢ = \$340.08$, the sum received for the crop.

47. $340.08 − $170.69 = $169.39, the profit.

48. The buyer's total expense = $340.08 + $50.70 = $390.78; he received $354\frac{1}{4} \times \$1.24$, or $439.27, for the peanuts; $439.27 − $390.78 = $48.49, his gain.

49. 215 bu. sold for 215 × $1.44 = $309.60; $354\frac{1}{4}$ bu. − 215 bu., or $139\frac{1}{4}$ bu. sold for $139\frac{1}{4} \times \$1.36 = \$189.38$; $309.60 + $189.38 = $498.98, the sum he received; then, he gained $498.98 − $439.27, or $59.71.

Page 166

51. At $2 per thousand, 7500 plants cost 7.5 × $2, or $15.

$3\frac{3}{4}$ T. of straw cost $3\frac{3}{4} \times \$4$, or $15.

The cost of cultivation = $2.25 + $15 + $2.75 + $8.50 + $18.75 + $15 + $1.50 + $15 = $78.75.

52. At $15 per hundred, 150 crates cost 1.5 × $15, or $22.50.

At $3 per thousand, 4800 baskets cost 4.8 × $3, or $14.40.

53. The cost of picking = $4800 \times 1\frac{1}{2}¢ = \$72$.

The cost of shipping and selling = 150 × 54¢ = $81.

54. The expense of harvesting and marketing = $22.50 + $14.40 + $72 + $81 = $189.90.

55. The gardener's total expense = $78.75 + $189.90 = $268.65.

56. The receipts at each price were, respectively: 2 × $5.12, or $10.24; 12 × $4.16, or $49.92; 36 × $3.80, or $136.80; 76 × $2.48, or $188.48; 24 × $1.94, or $46.56. Hence, the total receipts = $10.24 + $49.92 + $136.80 + $188.48 + $46.56 = $432.

57. He gained $432 – $268.65 = $163.35.

58. The average price received per bushel crate = $432 ÷ 150 = $2.88.

1 bu. = 32 qt. Since $2.88 was the average price per bushel, the average price per quart = $2.88 ÷ 32 = $.09.

The highest price per quart = $5.12 ÷ 32 = $.16.

The lowest price per quart = $\$1.94 \div 32 = \$.06\frac{1}{16}$.

59. Since $\frac{3}{4}$ A. yielded 4800 qt., $\frac{1}{4}$ A. would yield $\frac{1}{3}$ of 4800 qt., or 1600 qt., and $\frac{4}{4}$, or 1 A., would yield 4 × 1600 qt., or 6400 qt.

Page 170

101. $\frac{7}{8} - \frac{7}{10} = \frac{7}{40}$; that is, $\frac{7}{8}$ is $\frac{7}{40}$ greater than $\frac{7}{10}$.
$\frac{7}{8} \div \frac{7}{10} = 1\frac{1}{4}$; that is, $\frac{7}{8}$ is $1\frac{1}{4}$ times $\frac{7}{10}$.

102. $\frac{7}{10} - \frac{7}{12} = \frac{7}{60}$; that is, $\frac{7}{12}$ is $\frac{7}{60}$ less than $\frac{7}{10}$.
$\frac{7}{12} \div \frac{7}{10} = \frac{5}{6}$; that is, $\frac{7}{12}$ is $\frac{5}{6}$ of $\frac{7}{10}$.

103. The volume of a standard brick = $(8\frac{1}{4} \times 4 \times 2\frac{1}{4})$ cu. in. = $74\frac{1}{4}$ cu. in.

104. The volume of a Milwaukee brick = $(8\frac{1}{2} \times 4\frac{1}{8} \times 2\frac{3}{8})$ cu. in. = $83\frac{35}{128}$ cu. in. Hence, a Milwaukee brick is $83\frac{35}{128}$ cu. in. – $74\frac{1}{4}$ cu. in., or $9\frac{3}{128}$ cu. in., greater.

The volume of a Maine brick = $(7\frac{1}{2} \times 3\frac{3}{8} \times 2\frac{3}{8})$ cu. in. = $60\frac{15}{128}$ cu. in. Hence, a Maine brick is $74\frac{1}{4}$ cu. in. – $60\frac{15}{128}$ cu. in., or $14\frac{17}{128}$ cu. in., less.

The volume of a North River brick = $(8 \times 3\frac{1}{2} \times 2\frac{1}{4})$ cu. in. = 63 cu. in. Hence, a North River brick is $74\frac{1}{4}$ cu. in. – 63 cu. in., or $11\frac{1}{4}$ cu. in., less.

105. The volume of 1000 Milwaukee bricks = $1000 \times 83\frac{35}{128}$ cu. in. = $83{,}273\frac{7}{16}$ cu. in. 1000 Milwaukee bricks are equivalent in volume to as many standard bricks as $74\frac{1}{4}$ cu. in. is contained times in $83{,}273\frac{7}{16}$ cu. in.; that is, $83{,}273\frac{7}{16}$ cu. in. ÷ $74\frac{1}{4}$ cu. in. = $1121\frac{19}{36}$, the number of standard bricks.

The volume of 1000 North River bricks = 1000 × 63 cu. in. = 63,000 cu. in. The number of standard bricks equivalent in volume to 1000 North River bricks = 63,000 cu. in. ÷ $74\frac{1}{4}$ cu. in. = $848\frac{16}{33}$.

Page 171

1. From 7 A.M., Mon., to 7 A.M., Sat., is 5 × 24 hr., or 120 hr.; from 7 A.M. to 12 M., Sat., is 5 hr.; 120 hr. + 5 hr., or 125 hr., is the length of time the mill runs per week; then, the amount of flour turned out per week = 125 × 30 bbl. = 3750 bbl.; 52 × 3750 bbl. = 195,000 bbl., the amount per year.

2. 35,670 cu. ft. − 28,470 cu. ft. = 7200 cu. ft., used during the quarter; at 90¢ per 1000 cu. ft., 7200 cu. ft. cost 7.200 × 90¢, or $6.48.

3. At $20\frac{1}{2}$¢ per 100 lb., the charges on 48,200 lb. = 482 × $20\frac{1}{2}$¢ = $98.81.

4. $\frac{1}{2}$ of 240,000 copies = 120,000 copies, sent by mail; they weigh 120,000 × $2\frac{7}{8}$ oz., or 345,000 oz.; 345,000 ÷ 16 = $21{,}562\frac{1}{2}$, the number of pounds.

Postage for one day costs $21{,}562\frac{1}{2} \times 1$¢ = $$215.62\frac{1}{2}$.

Postage for 313 days costs 313 × $$215.62\frac{1}{2}$ = $$67{,}490.62\frac{1}{2}$, or $67,490.63.

5. 1 hr. 54 min. = 114 min.; 1 hr., or 60 min., is $\frac{60}{114}$ of 114 min.; then, if the train ran 133.4 mi. in 114 min., its rate for 60 min. was $\frac{60}{114}$ of 133.4 mi., or $70\frac{4}{19}$ mi.

6. 60 ÷ 4 = 15; that is, 60 is 15 times 4; if the train ran 7.29 mi. in 4 min., in 1 hr., or 60 min., it would run 15 × 7.29 mi., or 109.35 mi.

7. The area of 1 side = $(6 \times 2\frac{2}{3})$ sq. ft. = 16 sq. ft.; of 2 sides, 2 × 16 sq. ft. = 32 sq. ft.

The area of 1 end = $(2\frac{1}{2} \times 2\frac{2}{3})$ sq. ft. = $6\frac{2}{3}$ sq. ft.; of 2 ends, $2 \times 6\frac{2}{3}$ sq. ft. = $13\frac{1}{3}$ sq. ft.

The area of the bottom = $(6 \times 2\frac{1}{2})$ sq. ft. = 15 sq. ft.

The total area = 32 sq. ft. + $13\frac{1}{3}$ sq. ft. + 15 sq. ft. = $60\frac{1}{3}$ sq. ft.

The lead weighed $60\frac{1}{3} \times 3\frac{1}{2}$ lb. = $211\frac{1}{6}$ lb.; $211\frac{1}{6} \times 6$¢ = $12.67, the cost.

8. At $10 per 1000 ft., 3960 ft. of tile cost 3.96 × $10 = $39.60.

3960 ft. = 3960 ÷ $16\frac{1}{2}$, or 240, rd.; the cost of digging and filling 3960 ft., or 240 rd., of ditch = 240 × $33\frac{1}{3}$¢ = $80.

Then, the total cost = $39.60 + $80 = $119.60.

9. $3900 − $2125 = $1775, the total increase in value.

Then, the increase in value per acre = $1775 ÷ $62\frac{1}{2}$ = $28.40.

Page 172

10. The engineer received 120 × $3\frac{1}{2}$¢, or $4.20, per day, and 30 × $4.20, or $126, per month; the fireman received 120 × 2¢, or $2.40, per day, and 30 × $2.40, or $72, per month; 2 trainmen together earned 2 × $60, or $120, per month.

The total wages per month = $126 + $72 + $125 + $120 + $84 = $527.

11. 22,360 bunches + 19,250 bunches + 20,780 bunches = 62,390 bunches.

12. 26 × 360 boxes = 9360 boxes; 2 hr. 10 min. = 130 min.; then, 9360 boxes ÷ 130 = 72 boxes, the number sold per minute.

13. $21,060 ÷ 9360 = $2.25, the average price per box.

14. 630,000 pineapples ÷ 21,000 = 30 pineapples, the average per crate.
$45,000 ÷ 21,000 = $$2\frac{1}{7}$, the average price per crate.
$1\frac{1}{2}$ hr. = $1\frac{1}{2}$ × 60, or 90, min.; 21,000 crates ÷ 90 = $233\frac{1}{3}$ crates, the average number sold per minute.

15. 150 × $4.75 = $712.50, the cost.

16. 125 × 80 qt. = 10,000 qt., a car load

17. 125 × 200 lb. = 25,000 lb., for the whole car load.

18. 25,000 lb. = 25,000 ÷ 2000, or $12\frac{1}{2}$, T.; $12\frac{1}{2}$ × $2.15 = $$26.87\frac{1}{2}$, or $26.88, the cost.

19. 10,000 × 35¢ = $3500, the amount received.

Page 173

20. 2201 boxes, or 22,010 lb., sold for 22,010 × $6\frac{1}{2}$¢ = $1430.65;
6365 boxes, or 63,650 lb., sold for 63,650 × $5\frac{1}{2}$¢ = $3500.75;
32,219 lb. sold for 32,219 × 7¢ = $2255.33.
The value of the whole crop = $1430.65 + $3500.75 + $2255.33 = $7186.73.

21. 1600 boxes sold for 1600 × 90¢ = $1440; 1600 × 10 lb. = 16,000 lb.; picking and packing 16,000 lb. cost 16,000 × 1¢ = $160; freight and refrigeration cost 1600 × 22¢ = $352; then, the total expenses = $160 + $352 + $25 = $537; $1440 − $537 = $903, the amount less expenses.

22. 16,000 × $5\frac{3}{8}$¢ = $860, the amount he would have received; hence, by shipping the cherries he gained $903 − $860 = $43.

23. $121.60 ÷ 640 = $.19, the cost per box.

24. 44,000 lb. ÷ 100 lb. = 440; 440 × $1.25 = $550, the freight charges.

25. 4200 × $1.25 = $5250, the value in Jacksonville.
4200 × $2.10 = $8820, the value, wholesale, in New York.
4200 × 30 pineapples = 126,000 pineapples; 126,000 × 15¢ = $18,900, the retail value.

26. 172 oranges ÷ 12 = $14\frac{1}{3}$ doz. oranges; $4.30 ÷ $14\frac{1}{3}$ = $.30, the price per dozen.

27. 240 × $3\frac{1}{4}$ lb. = 780 lb.; 780 × $12\frac{1}{2}$¢ = $97.50, if sold by the pound;
240 fowls ÷ 12 = 20 doz. fowls; 20 × $4.75 = $95, if sold by the dozen;
Hence, the first offer is better by $97.50 − $95, or $2.50.

28. The total weight = 61,460 lb. + 64,750 lb. + 28,800 lb. + 19,200 lb. + 6750 lb. = 180,960 lb.; 180,960 lb. ÷ 100 lb. = 1809.6; 1809.6 × $22\frac{1}{2}$¢ = $407.16, the cost of the freight.

Page 174

29. $1\frac{1}{2}$ T. = $1\frac{1}{2}$ × 2000 lb., or 3000 lb.; $82.50 ÷ 3000 = $.02$\frac{3}{4}$, the cost per pound.

30. 3000 lb. sold for 30 × $4.50 = $135; $135 − $82.50 = $52.50, the gain.

31. The cost of producing 500 gal. of sirup = 500 × $14\frac{4}{5}$¢ = $74.
Hence, it cost $82.50 − $74, or $8.50, more to manufacture sugar.

32. The sugar sold for 30 × $4.50, or $135; the sirup sold for 500 × $24\frac{1}{2}$¢ = $122.50; then, the gain on the sugar = $135 − $82.50 = $52.50, and on the sirup = $122.50 − $74 = $48.50; $52.50 − $48.50, or $4, more for sugar.

33. The time required to run 1 mi. = $13\frac{1}{2}$ min. ÷ $3\frac{3}{4}$ = $3\frac{3}{5}$ min.
The average speed per minute = $3\frac{3}{4}$ mi. ÷ $13\frac{1}{2}$ = $\frac{5}{18}$ mi.

34. 8 gal. = 8 × 4 qt., or 32 qt.; 32 qt. of milk weigh 32 × 2.15 lb. = 68.8 lb.; the entire weight = 15 lb. + 68.8 lb. = 83.8 lb.

35. 8 gal. of water weigh 8 × $8\frac{1}{3}$ lb. = $66\frac{2}{3}$ lb.; $66\frac{2}{3}$ lb. + 15 lb. = $81\frac{2}{3}$ lb., the weight of an 8-gal. can full of water; 83.8 lb. − $81\frac{2}{3}$ lb. = $2\frac{2}{15}$ lb., more.

36. The area = (22 × 4) sq. ft. = 88 sq. ft.; 88 × $\frac{3}{4}$¢ = 66¢, the cost.

37. The mill uses per day, 15 × 490 lb., or 7350 lb.; per year, 300 × 7350 lb., or 2,205,000 lb.; then, the number of acres required = 2,205,000 lb. ÷ 250 lb. = 8820.

Page 175

38. The amount saved on each rivet = $3\frac{1}{2}$¢ − $1\frac{1}{4}$¢ = $2\frac{1}{4}$¢.
The amount saved on 200,000 rivets = 200,000 × $2\frac{1}{4}$¢ = $4500

39. 45,000 lb. ÷ 60 lb. = 750, the total number of bushels;
750 bu. ÷ 18 = $41\frac{2}{3}$ bu., the amount unloaded per minute.

40. $5\frac{1}{2}$ × 96¢ = $5.28, the cost of surveying.

41. $5\frac{1}{2}$ mi. = $5\frac{1}{2}$ × 5280 ft., or 29,040 ft.; 29,040 ft. ÷ 132 ft. = 220, the number of poles.
220 × $1.25 = $275, the cost of the poles.

42. 220 × 19¢ = $41.80, the cost of digging the holes.

43. 220 × 5¢ = $11, the cost for labor.
220 × 2 brackets = 440 brackets; 440 ÷ 1000 = .44; at $12 per thousand, 440 brackets cost .44 × $12, or $5.28.
440 insulators, at $21 per thousand, cost .44 × $21, or $9.24.
440 × 2 spikes = 880 spikes; 880 spikes cost 880 × $\frac{3}{8}$¢ = $3.30.
Then, fitting the poles cost $11 + $5.28 + $9.24 + $3.30 = $28.82.

44. 220 × 17¢ = $37.40, the cost of setting the poles.

45. There were 2 × $5\frac{1}{2}$ mi., or 11 mi., of wire; the wire weighed 11 × 165 lb., or 1815 lb.; it cost 1815 × $4\frac{3}{4}$¢ = 86.21\frac{1}{4}$, or $86.21 to the nearest cent.

46. $5\frac{1}{2} \times \$6 = \$33$, the cost for trimming trees and stringing the wires.

47. The total cost $= \$5.28 + \$275 + \$41.80 + \$28.82 + \$37.40 + \$86.21 + \$33 = \$507.51$.

48. The population $= 6517 + 6731 = 13{,}248$;
$13{,}248 \div 32 = 414$, the total number of subscribers.

Page 176

49. $414 \times \$14.25 = \$5899.50$, expended for instruments.

50. $12 \times \$2.50 = \$30$, the amount each paid per year;
$414 \times \$30 = \$12{,}420$, the annual income from subscribers.

51. $\$12{,}420 \div 776{,}250 = \$.016$, or 1.6¢, the average cost per call.

52. 4 min. 7 sec. = 240 sec. + 7 sec. = 247 sec.; 247 sec. ÷ 100 = 2.47 sec., the average time for 1 connection.

53. The ducks gained 108.75 lb. − 22.5 lb., or 86.25 lb., more.

54. 108.75 lb. ÷ 22.5 lb. = 4.833; that is, 108.75 lb. is 4.83 times 22.5 lb.;
Hence, the ducks gained 4.83 times as much.

55. The average gain of 1 duck = 108.75 lb. ÷ 39 = 2.788^{+} lb.;
The average gain of 1 chicken = 22.5 lb. ÷ 39 = $.577^{-}$ lb.;
Then, 1 duck gained 2.788 lb. − .577 lb., or 2.21 lb., more than 1 chicken.

56. The ducks gained 108.75 lb. ÷ 5, or 21.75 lb., per week;
The chickens gained 22.5 lb. ÷ 5, or 4.5 lb., per week;
The ducks gained 21.75 lb. − 4.5 lb., or 17.25 lb., more per week.

57. It cost $\$2.07 - \$1.09$, or $\$.98$ more to feed the ducks;
It cost $\$.98 \div 39 = \$.0251^{+}$, or 2.51¢ more to feed 1 duck than 1 chicken.

58. The relation between the costs for all is the same as that between the costs for one; $\$2.07 \div \$1.09 = 1.899^{+}$; that is, \$2.07 is 1.90 times \$1.09. Hence, it cost 1.90 times as much to feed 1 duck as 1 chicken.

59. $\$2.07 \div 5 = \$.414$, the cost of feeding 39 ducks for 1 wk.; 100 is $\frac{100}{39}$ times 39; hence, to feed 100 ducks for 1 wk. will cost $\frac{100}{39} \times \$.414 = \$1.062^{-}$, or \$1.06.

Page 179

28. Since 5280 ft. = 1 mi., the number of miles in 29,002 ft. is 29,002 ft. ÷ 5280 ft. = 5, and 2602 ft. over; then, Mt. Everest is 5 mi. 2602 ft. high.

29. 5 gal. = 5 × 4 qt., or 20 qt., = 20 × 2 pt., or 40 pt.; for a gain of \$1.40, 5 gal., or 40 pt., must sell for \$5 + \$1.40, or \$6.40; then, 1 pt. must sell for \$6.40 ÷ 40, or \$.16.

30. 4 gal. = 4 × 4 qt., or 16 qt.; 16 qt. + 3 qt. = 19 qt. = 19 × 2 pt., or 38 pt.; if a pint of ice cream serves 3 persons, 4 gal. 3 qt., or 38 pt., will serve 38 × 3 persons = 114 persons.

31. 1 bu. = 4 pk.; 4 pk. + 2 pk. = 6 pk. = 6 × 8 qt., or 48 qt.; 48 × 15¢ = $7.20, the sum received for the strawberries; $7.20 – $4.75 = $2.45, the gain.

32. 45 mi. = 45 × 5280 ft. = 237,600 ft.; since the train is running 45 mi., or 237,600 ft., per hour, the rate per minute = 237,600 ft. ÷ 60 = 3960 ft.; and the rate per second = 3960 ft. ÷ 60 = 66 ft.

33. When the automobile is running 44 ft. per second, the rate per minute = 60 × 44 ft. = 2640 ft.; the rate per hour = 60 × 2640 ft. = 158,400 ft.; 158,400 ft. ÷ 5280 ft. = 30, the rate in miles per hour.

34. 30 in. = (30 ÷ 12) ft., or $2\frac{1}{2}$ ft.; the distance marched per second = 2 × $2\frac{1}{2}$ ft., or 5 ft.; the distance marched per minute = 60 × 5 ft., or 300 ft.; 3 hr. 40 min. = 3 × 60 min., or 180 min., + 40 min. = 220 min.; then, the distance marched in 3 hr. 40 min. = 220 × 300 ft., or 66,000 ft.; 66,000 ft. ÷ 5280 ft. = $12\frac{1}{2}$, the number of miles.

35. The average height of a story = 309 ft. ÷ 29 = $10\frac{19}{29}$ ft.; $\frac{19}{29}$ ft. = $\frac{19}{29}$ × 12 in., or $7\frac{25}{29}$ in.; then the height of a story is 10 ft. $7\frac{25}{29}$ in.

Page 180

4. 1 day = 24 hr.; $4\frac{1}{2}$ hr. ÷ 24 hr. = $\frac{3}{16}$; that is, $4\frac{1}{2}$ hr. is $\frac{3}{16}$ of a day.

5. 1 yd. = 3 ft. = 3 × 12 in., or 36 in.; 1 ft. $1\frac{1}{2}$ in. = 12 in. + $1\frac{1}{2}$ in. = $13\frac{1}{2}$ in.; $13\frac{1}{2}$ in. ÷ 36 in. = $\frac{3}{8}$; that is, 1 ft. $1\frac{1}{2}$ in. is $\frac{3}{8}$ of a yard.

6. 1 gal. = 4 qt. = 4 × 2 pt., or 8 pt.; 2 qt. $1\frac{1}{2}$ pt. = 2 × 2 pt., or 4 pt., + $1\frac{1}{2}$ pt. = $5\frac{1}{2}$ pt.; $5\frac{1}{2}$ pt. ÷ 8 pt. = $\frac{11}{16}$; that is, 2 qt. $1\frac{1}{2}$ pt. is $\frac{11}{16}$ of a gallon.

7. 1 bu. = 4 pk. = 4 × 8 qt., or 32 qt.; 2 pk. 3 qt. = 2 × 8 qt., or 16 qt., + 3 qt. = 19 qt.; 2 pk. 3 qt. is $\frac{19}{32}$ of a bushel.

8. A long ton = 2240 lb.; a short ton = 2000 lb.; then, a short ton is $\frac{2000}{2240}$, or $\frac{25}{28}$, of a long ton.

9. 1 cu. yd. = 27 cu. ft. = 27 × 1728 cu. in., or 46,656 cu. in.; 20 cu. ft. 432 cu. in. = 20 × 1728 cu. in., or 34,560 cu. in., + 432 cu. in. = 34,992 cu. in.

20 cu. ft. 432 cu. in. is $\frac{34{,}992}{46{,}656}$, or $\frac{3}{4}$, of a cubic yard.

10. 1 mi. = 5280 ft.; 1293.6 ft. ÷ 5280 ft. = .245, the decimal part of a mile.

11. 1 T. = 2000 lb.; 7 cwt. 64 lb. = 764 lb.

764 lb. ÷ 2000 lb. = .382, the decimal part of a ton.

12. 1 hr. = 60 min. = 60 × 60 sec., or 3600 sec.; 1 min. 48 sec. = 60 sec. + 48 sec. = 108 sec.

108 sec. ÷ 3600 sec. = .03, the decimal part of an hour.

13. 1 wk. = 7 days = 7 × 24 hr., or 168 hr.; 2 days 10.8 hr. = 2 × 24 hr., or 48 hr., + 10.8 hr. = 58.8 hr.

58.8 hr. ÷ 168 hr. = .35, the decimal part of a week.

14. A right angle = 90° = 90 × 60′, or 5400′; 4° 30′ = 4 × 60′, or 240′, + 30′ = 270′.

270′ ÷ 5400′ = .05, the decimal part of a right angle.

15. 1 sq. mi. = 640 A.; 230.4 A. ÷ 640 A. = .36, the decimal part of a square mile.

16. 28.5 yd. = 28.5 × 3 ft., or 85.5 ft. = 85.5 × 12 in., or 1026 in.

17. 3.1875 bu. = 3.1875 × 4 pk., or 12.75 pk. = 12.75 × 8 qt., or 102 qt.

18. 2.428 T. = 2.428 × 2000 lb. = 4856 lb.

19. .96875 mi. = .96875 × 5280 ft. = 5115 ft.

20. $\frac{5}{16}$ gal. = $\frac{5}{16}$ × 4 qt., or $1\frac{1}{4}$ qt.; $\frac{1}{4}$ qt. = $\frac{1}{4}$ × 2 pt., or $\frac{1}{2}$ pt.; then, $\frac{5}{16}$ gal. = 1 qt. $\frac{1}{2}$ pt.

21. 1° = 60′ = 60 × 60″, or 3600″; 39′ $22\frac{1}{2}$″ = 39 × 60″, or 2340″, + $22\frac{1}{2}$″ = $2362\frac{1}{2}$″.

$2362\frac{1}{2}$″ ÷ 3600″ = $\frac{21}{32}$, the fraction of a degree.

22. $\frac{7}{8}$ of 90° = $78\frac{3}{4}$°; $\frac{3}{4}$° = $\frac{3}{4}$ × 60′, or 45′; then, $\frac{7}{8}$ of a right angle = 78° 45′.

23. $\frac{5}{8}$ cu. yd. = $\frac{5}{8}$ of 27 cu. ft. = $16\frac{7}{8}$ cu. ft.; $\frac{7}{8}$ cu. ft. = $\frac{7}{8}$ × 1728 cu. in. = 1512 cu. in.; then, $\frac{5}{8}$ cu. yd. = 16 cu. ft. 1512 cu. in.

24. .9 of a day = .9 × 24 hr., or 21.6 hr.; .6 hr. = .6 × 60 min., or 36 min.; then, .9 of a day = 21 hr. 36 min.

Page 184

11. 6 ft. 3 in. = 72 in. + 3 in., or 75 in.; 4 ft. 7 in. = 48 in. + 7 in., or 55 in.;

The area in square inches = 75 × 55, or 4125 sq. in.;

The area in square feet = 4125 ÷ 144, or 28.646⁻ sq. ft.

12. 75 ft. $2\frac{1}{2}$ in. = 900 in. + $2\frac{1}{2}$ in., or $902\frac{1}{2}$ in.; 32 ft. $4\frac{1}{2}$ in. = 384 in. + $4\frac{1}{2}$ in., or $388\frac{1}{2}$ in.;

The area in square inches = $902\frac{1}{2}$ × $388\frac{1}{2}$, or $350{,}621\frac{1}{4}$ sq. in.;

The area in square feet = $350{,}621\frac{1}{4}$ ÷ 144, or 2434.87⁻ sq. ft.

13. 44 ft. 1 in. = 528 in. + 1 in., or 529 in.; 10 ft. 4 in. = 120 in. + 4 in., or 124 in.;

The area in square inches = $\frac{1}{2}$ of 529 × 124, or 32,798 sq. in.;

The area in square feet = 32,798 ÷ 144, or 227.764⁻ sq. ft.

14. 60 ft. 5 in. = 720 in. + 5 in., or 725 in.; 33 ft. 11 in. = 396 in. + 11 in., or 407 in.;

The area in square inches = $\frac{1}{2}$ of 725 × 407, or $147{,}537\frac{1}{2}$ sq. in.;

The area in square feet = $147{,}537\frac{1}{2}$ ÷ 144, or 1024.566⁻ sq. ft.

15. 18 ft. 6 in. = $18\frac{1}{2}$ ft.; the area = ($18\frac{1}{2} \times 18\frac{1}{2}$) sq. ft., or 342.25 sq. ft.

16. 24 rd. 2 ft. = 396 ft. + 2 ft., or 398 ft.; 22 rd. = 363 ft.;
The area = (398 × 363) sq. ft., or 144,474 sq. ft.

Page 185

17. 24 ft. 7 in. = 288 in. + 7 in., or 295 in.; 12 ft. 11 in. = 144 in. + 11 in., or 155 in.; 5 ft. 4 in. = 60 in. + 4 in., or 64 in.;
The volume in cubic inches = 295 × 155 × 64, or 2,926,400 cu. in.;
The volume in cubic feet = 2,926,400 ÷ 1728, or 1693.519^- cu. ft.

18. 19 ft. 4 in. = 228 in. + 4 in., or 232 in.; 12 ft. 7 in. = 144 in. + 7 in., or 151 in.; 6 ft. 2 in. = 72 in. + 2 in., or 74 in.;
The volume in cubic inches = 232 × 151 × 74, or 2,592,368 cu. in.;
The volume in cubic feet = 2,592,368 ÷ 1728, or 1500.213^- cu. ft.

19. 28 ft. $3\frac{1}{2}$ in. = 336 in. + $3\frac{1}{2}$ in., or $339\frac{1}{2}$ in.; 20 ft. 4 in. = 240 in. + 4 in., or 244 in.; 5 ft. = 60 in.;
The volume in cubic inches = $339\frac{1}{2} \times 244 \times 60$, or 4,970,280 cu. in.;
The volume in cubic feet = 4,970,280 ÷ 1728, or 2876.32^- cu. ft.

20. 52 ft. $7\frac{1}{2}$ in. = 624 in. + $7\frac{1}{2}$ in., or $631\frac{1}{2}$ in.; 33 ft. 6 in. = 396 in. + 6 in., or 402 in.; 5 ft. 10 in. = 60 in. + 10 in., or 70 in.;
The volume in cubic inches = $631\frac{1}{2} \times 402 \times 70$, or 17,770,410 cu. in.;
The volume in cubic feet = 17,770,410 ÷ 1728, or $10{,}283.802^+$ cu. ft.

Page 186

15. Since in 1 revolution the wheel goes 8 ft. 3 in., or $8\frac{1}{4}$ ft., the number of revolutions it makes in going 5280 ft. = 5280 ft. ÷ $8\frac{1}{4}$ ft., or 640 revolutions.

16. 3 mi. 240 rd. = 960 rd. + 240 rd., or 1200 rd.; the length of each side = 1200 rd. ÷ 4, or 300 rd.
The area in square rods = 300 × 300, or 90,000 sq. rd.;
The area in acres = 90,000 ÷ 160, or $562\frac{1}{2}$ A.

17. $31\frac{1}{2}$ bu. = $31\frac{1}{2} \times 4$ pk., or 126 pk.; since $1\frac{1}{2}$ pk. last 1 day, 126 pk. will last as many days as $1\frac{1}{2}$ pk. is contained times in 126 pk., that is, 126 pk. ÷ $1\frac{1}{2}$ pk., or 84; 84 days = (84 ÷ 7) wk., or 12 wk.

18. 30 cwt. = 3000 lb.; there are as many bushels in 3000 lb. of oats as 32 lb. is contained times in 3000 lb., that is, 3000 lb. ÷ 32 lb., or $93\frac{3}{4}$; $93\frac{3}{4}$ bu. = $93\frac{3}{4} \times 4$ pk., or 375 pk.; 375 pk. will last as many days as $1\frac{1}{2}$ pk. is contained times in 375 pk., that is, 375 pk. ÷ $1\frac{1}{2}$ pk., or 250; 250 days = (250 ÷ 7) wk., or 35 wk. and 5 days over.

20. Since $38\frac{1}{4}$ is the product of the number of feet in the base and the number of feet in the altitude, and the base is $8\frac{1}{2}$ ft., the number of feet in the altitude is $38\frac{1}{4} \div 8\frac{1}{2}$, or $4\frac{1}{2}$. Hence, the altitude is $4\frac{1}{2}$ ft.

21. 1 A. = 160 sq. rd.; since 160 is the product of the number of rods in the base and the number of rods in the altitude, and the altitude is $10\frac{2}{3}$ rd., the number of rods in the base is 160 ÷ $10\frac{2}{3}$, or 15. Hence, the base is 15 rd.

22. 10 A. = 10 × 160 sq. rd., or 1600 sq. rd.; since 1600 is $\frac{1}{2}$ of the product of the number of rods in the base and the number of rods in the altitude, the whole product is 2 × 1600, or 3200; and since the base is $53\frac{1}{3}$ rd., the number of rods in the altitude is 3200 ÷ $53\frac{1}{3}$, or 60. Hence, the altitude is 60 rd.

Page 187

1. 158,750 lb. = (158,750 ÷ 2000) T., or 79 T. and 750 lb. over.

2. $\frac{1}{3}$ of 86 ft. = 28 ft. and 2 ft. remainder; 2 ft. 3 in. = 2 × 12, or 24, in. + 3 in. = 27 in.; $\frac{1}{3}$ of 27 in. = 9 in.; then, the width of the house is 28 ft. 9 in.

3. 9 boxes of pencils cost 9 × $2.25, or $20.25; 1 gross = 12 × 12, or 144; 9 half-gross = $\frac{9}{2}$ × 144, or 648; at 5¢ apiece 648 pencils cost 648 × 5¢, or $32.40; then, $32.40 − $20.25 = $12.15, the gain.

4. The amount paid for 6 × $4\frac{1}{3}$ sq. yd., or 26 sq. yd. = 26 × $3, or $78.

5. 1 T. 35 lb. = 2035 lb.; 2035 lb. ÷ 11 = 185 lb., the average weight.

6. The heart pumps 70 × 6 oz., or 420 oz., per minute; 60 × 420 oz., or 25,200 oz., per hour; and 24 × 25,200 oz., or 604,800 oz., per day; 604,800 oz. = 604,800 ÷ 16, or 37,800, lb. = 37,800 ÷ 2000, or 18.9, T.

7. 1 lb. = 16 oz.; 4 oz. is $\frac{4}{16}$, or $\frac{1}{4}$, of a pound; since 1 lb. of tea makes $7\frac{1}{2}$ gal. of liquid tea, 4 oz. will make $\frac{1}{4}$ of $7\frac{1}{2}$ gal., or $1\frac{7}{8}$ gal.

8. $721\frac{1}{2}$ lb. ÷ 74 = $9\frac{3}{4}$ lb., the average clip per sheep.

9. 18 × $293\frac{1}{3}$ yd. = 5280 yd.; since 1760 yd. = 1 mi., 5280 yd. ÷ 1760 yd. = 3, the number of miles the athlete ran.

10.

1 T.	14 cwt.	64 lb.
3	00	49
2	9	00
5	18	87
13	3	00

Since the total weight = 13 T. 3 cwt., or 263 cwt., the freight charges = 263 × $.25, or $65.75.

11. The sum received for 5 gal. − $3\frac{7}{8}$ gal., or $1\frac{1}{8}$ gal., was clear gain; $1\frac{1}{8}$ gal. = $1\frac{1}{8}$ × 4 qt., or $4\frac{1}{2}$ qt.; then, the gain = $4\frac{1}{2}$ × 36¢, or $1.62.

12. 31 days in March + 30 days in April + 31 days in May + 30 days in June + 31 days in July + 31 days in August = 184 days = 184 × 24 hr., or 4416 hr.; 642 T. 1056 lb. = 642 × 2000, or 1,284,000, lb. + 1056 lb. = 1,285,056 lb.

Then, the amount of coal consumed per hour = 1,285,056 lb. ÷ 4416 = 291 lb.

Page 190

14. The quantity of good seed = 93 %, or .93, of 60 lb. = 55.8 lb.

15. He paid 88 %, or .88, of $ 15 = $ 13.20.

16. There were in the crew 40 %, or .40, of 1380 persons = 552 persons.

17. The distance traveled in a day = 14 %, or .14, of 3255 mi. = 455.7 mi.

18. The expense of raising = 48 %, or .48, of $ 743.75 = $ 357.

19. The sum paid for the wheat = 68 %, or .68, of $ 4.75 = $ 3.23.

20. He sold them for 92 %, or .92, of $ 115.50 = $ 106.26.

Page 193

17. 80 %, or $\frac{4}{5}$, of 750 = 600, the average number of fish taken.

18. The state contributed $66\frac{2}{3}$ %, or $\frac{2}{3}$, of $ 5685.30 = $ 3790.20.
County and town each contributed $16\frac{2}{3}$ %, or $\frac{1}{6}$, of $ 5685.30 = $ 947.55.

19. The selling price = $262\frac{1}{2}$ % of $ 1.60, or $2\frac{5}{8}$ × $ 1.60 = $ 4.20.

Page 194

20. The number native born = $87\frac{1}{2}$ %, or $\frac{7}{8}$, of 1528 = 1337.

21. The income from advertisements = $37\frac{1}{2}$ %, or $\frac{3}{8}$, of $ 14,568 = $ 5463.
The income from sales, etc. = $33\frac{1}{3}$ %, or $\frac{1}{3}$, of $ 14,568 = $ 4856.

22. The amount of sugar contained = $16\frac{2}{3}$ %, or $\frac{1}{6}$, of 18,756 lb. = 3126 lb.
The amount of sugar extracted = 75 %, or $\frac{3}{4}$, of 3126 lb. = $2344\frac{1}{2}$ lb.

---

16. The helmet weighs 64 %, or .64, of 125 lb. = 80 lb.

17. The average yield per tree = $6\frac{1}{4}$ %, or $.06\frac{1}{4}$, of 128 bunches = 8 bunches.
The average weight per bunch = 40 %, or $\frac{2}{5}$, of 45 lb. = 18 lb.

18. The picking cost 30 %, or .30, of $ 196.50 = $ 58.95.
He received for them $283\frac{1}{3}$ % of, or $2\frac{5}{6}$ times, $ 196.50 = $ 556.75.

Page 195

19. The loss of weight = $7\frac{1}{2}$ %, or $.07\frac{1}{2}$, of 25,000 lb. = 1875 lb.

20. 1200 bu. of potatoes weigh 1200 × 60 lb., or 72,000 lb.
Then, the output of starch = 16 %, or .16, of 72,000 lb. = 11,520 lb.

Page 196

18. 1 mi. = 320 rd.; 52 rd. ÷ 320 rd. = $.16\frac{1}{4}$; that is, 52 rd. is $16\frac{1}{4}$ % of 320 rd.

19. 1 section = 640 A.; 100 A. ÷ 640 A. = $.15\frac{5}{8}$; that is, 100 A. is $15\frac{5}{8}$ % of 1 section.

20. 1 T. = 2000 lb.; 910 lb. ÷ 2000 lb. = .455; that is, 910 lb. is $45\frac{1}{2}\%$ of 1 T.

21. 1 day = 24 hr. = 24 × 60 min., or 1440 min.; 1260 min. ÷ 1440 min. = .875; that is, 1260 min. is $87\frac{1}{2}\%$ of 1 day.

22. $198 ÷ $495 = .40; that is, the income was 40% of the cost.

Page 197

23. 180 mills ÷ 800 mills = .225; that is, 180 mills is $22\frac{1}{2}\%$ of 800 mills.
Hence, New York State contains $22\frac{1}{2}\%$ of the paper mills.

24. 282 pupils ÷ 752 pupils = .375; that is, 282 pupils is $37\frac{1}{2}\%$ of 752 pupils.
Hence, $37\frac{1}{2}\%$ of the pupils are in the high school.

25. 3570 T. ÷ 4760 T. = .75; that is, 3570 T. is 75% of 4760 T.
Hence, 75% of the supply was used.

26. $4900 ÷ $20,000 = .245; that is, $4900 is $24\frac{1}{2}\%$ of $20,000.
Hence, he could pay $24\frac{1}{2}\%$ of his debts.

27. 2739 baskets ÷ 6225 baskets = .44; that is, 2739 baskets is 44% of 6225 baskets. Hence, 44% of the fruit was spoiled.

28. 3640 ÷ 4160 = .875; that is, 3640 is $87\frac{1}{2}\%$ of 4160.
Hence, $87\frac{1}{2}\%$ of the population are miners.

29. 40,600 mi. ÷ 210,000 mi. = $.19\frac{1}{3}$; that is, 40,600 mi. is $19\frac{1}{3}\%$ of 210,000 mi.
Hence, $19\frac{1}{3}\%$ of the cable was in the Atlantic.

30. $.10 ÷ $20 = .005; that is, 10¢ is $\frac{1}{2}\%$ of $20.
Hence, $\frac{1}{2}\%$ of its weight had been worn away.

31. 60,000 Indians ÷ 270,000 Indians = $.22\frac{2}{9}$; that is, 60,000 Indians is $22\frac{2}{9}\%$ of 270,000 Indians.

Hence, $22\frac{2}{9}\%$ could speak English.

32. 7,725,000 bbl. ÷ 20,600,000 bbl. = .375; that is, 7,725,000 bbl. is $37\frac{1}{2}\%$ of 20,600,000 bbl.

Hence, Michigan produced $37\frac{1}{2}\%$ of the whole.

33. $140,625 ÷ $225,000 = .625; that is, $140,625 is $62\frac{1}{2}\%$ of $225,000.
$56,250 ÷ $225,000 = .25; that is, $56,250 is 25% of $225,000.
$28,125 ÷ $225,000 = .125; that is, $28,125 is $12\frac{1}{2}\%$ of $225,000.
Hence, Mr. Hale owns $62\frac{1}{2}\%$ of the business, Mr. Chesley, 25%, and Mr. Hoit, $12\frac{1}{2}\%$.

Page 200

19. Since 12%, or .12, of all the steel used was 1200 T., the total amount = 1200 T. ÷ .12 = 10,000 T.

20. Since 80%, or $\frac{4}{5}$, of the vessel's load was 6000 T., $\frac{1}{5}$ was $\frac{1}{4}$ of 6000 T., or 1500 T., and $\frac{5}{5}$, or the whole load = 5 × 1500 T. = 7500 T.

21. Since 20%, or $\frac{1}{5}$, of its weight was 4752 lb., the rough rice weighed 5 × 4752 lb. = 23,760 lb.

22. Since $62\frac{1}{2}$%, or $\frac{5}{8}$, of its capacity was 6875 T., $\frac{1}{8}$ was $\frac{1}{5}$ of 6875 T., or 1375 T., and $\frac{8}{8}$, or the total capacity = 8 × 1375 T. = 11,000 T.

23. Since 2%, or .02, of the wheat was 775 lb., the entire quantity = 775 lb. ÷ .02 = 38,750 lb.

24. Since 32%, or .32, of the population was 40,176, the entire population = 40,176 ÷ .32 = 125,550.

25. Since 80%, or $\frac{4}{5}$, of the butter was 180 lb., $\frac{1}{5}$ was $\frac{1}{4}$ of 180 lb., or 45 lb., and $\frac{5}{5}$, or the total yield by separating = 5 × 45 lb. = 225 lb.

26. Since 75%, or $\frac{3}{4}$, of the selling price was 12¢, $\frac{1}{4}$ was $\frac{1}{3}$ of 12¢, or 4¢, and $\frac{4}{4}$, or the selling price per dozen = 4 × 4¢ = 16¢; then, at 16¢ per dozen, 65 doz. ears of corn brought 65 × 16¢, or $10.40.

27. At $3\frac{1}{2}$¢ per pound, 196 lb. of flour sold for 196 × $3\frac{1}{2}$¢, or $6.86. Since 140%, or 1.40, of the cost was $6.86, the cost = $6.86 ÷ 1.40 = $4.90.

28. Since $\frac{4}{5}$%, or .008, of the barbed wire is 12 ft., the spool contains 12 ft. ÷ .008, or 1500 ft.

29. Since 55%, or .55, of the entire coal area is 154,220 sq. mi., the extent of the coal fields = 154,220 sq. mi. ÷ .55, or 280,400 sq. mi.

Page 202

8. Since 55%, or .55, of his debts is $275, Mr. Hall owes $275 ÷ .55, or $500.

9. $46\frac{2}{3}$%, or $.46\frac{2}{3}$, of 27,600 bu. = 12,880 bu., the wheat in the cargo.

10. $6\frac{7}{8}$ days ÷ $27\frac{1}{2}$ days = $\frac{1}{4}$, or .25; that is, $6\frac{7}{8}$ days is 25% of $27\frac{1}{2}$ days.
Hence, in $6\frac{7}{8}$ days, he painted 25% of the house.

11. Since $\frac{2}{5}$%, or .004, of the output each week is 28 shirts, the total weekly output = 28 shirts ÷ .004 = 7000 shirts.

12. 60%, or $\frac{3}{5}$, of 8270 bbl. = 4962 bbl., which sold for 4692 × $1.75, or $8683.50.
30%, or .30, of 8270 bbl. = 2481 bbl., which sold for 2481 × $2.25, or $5582.25.
60% + 30% = 90%; then the remainder = 100% − 90%, or 10%; 10%, or .10, of 8270 bbl. = 827 bbl., which sold for 827 × $1, or $827.
Then, the receipts = $8683.50 + $5582.25 + $827 = $15,092.75.
The cost = 8270 × $1.25 = $10,337.50.
Hence, the gain = $15,092.75 − $10,337.50 = $4755.25.

13. 1.79 in. ÷ 4 in. = $.44\frac{3}{4}$; that is, 1.79 in. is $44\frac{3}{4}$% of 4 in.
Hence, Massachusetts produced $44\frac{3}{4}$% of the total value.

14. .39 in. ÷ 4 in. = .09¾; that is, .39 in. is 9¾% of 4 in.
Hence, New York produced 9¾% of the total value.
.37 in. ÷ 4 in. = .09¼; that is, .37 in. is 9¼% of 4 in.
Hence, New Hampshire produced 9¼% of the total value.
.27 in. ÷ 4 in. = .06¾; that is, .27 in. is 6¾% of 4 in.
Hence, Ohio produced 6¾% of the total value.
.21 in. ÷ 4 in. = .05¼; that is, .21 in. is 5¼% of 4 in.
Hence, Pennsylvania produced 5¼% of the total value.
.19 in. ÷ 4 in. = .04¾; that is, .19 in. is 4¾% of 4 in.
Hence, Maine produced 4¾% of the total value.
.16 in. ÷ 4 in. = .04; that is, .16 in. is 4% of 4 in.
Hence, Illinois produced 4% of the total value.

15. The length of diagram representing the states mentioned = 1.79 in. + .39 in. + .37 in. + .27 in. + .21 in. + .19 in. + .16 in. = 3.38 in.; then, 4 in. − 3.38 in. = .62 in., the length of diagram for all the other states.
.62 in. ÷ 4 in. = .155; that is, .62 in. is 15½% of 4 in.
Hence, all the other states produced 15½% of the total value.

16. 64%, or .64, of 5,737,350 farms = 3,671,904 farms, worked by their owners.

17. Since 76%, or .76, of the wood used for pulp was 1,146,992 cords, the entire quantity = 1,146,992 cords ÷ .76 = 1,509,200 cords.

Page 204

7. The discount on 1 tent = 3%, or .03, of $28 = $.84; $28 − $.84 = $27.16, the net price.
The net cost = 12 × $27.16, or $325.92.
The total discount = 12 × $.84, or $10.08.

8. The discount on 1 rowboat = 10%, or .10, of $35 = $3.50; $35 − $3.50 = $31.50, the net price.
The net cost = 15 × $31.50, or $472.50.
The total discount = 15 × $3.50, or $52.50.

9. The discount on 1 shotgun = 37½%, or ⅜, of $32 = $12; $32 − $12 = $20, the net price.
The net cost = 20 × $20, or $400.
The total discount = 20 × $12, or $240.

10. The discount on 1 gun case = 16⅔%, or ⅙, of $3 = $.50; $3 − $.50 = $2.50, the net price.
The net cost = 18 × $2.50, or $45.
The total discount = 18 × $.50, or $9.

11. The discount on 1 revolver $= 33\frac{1}{3}\%$, or $\frac{1}{3}$, of \$7.50 = \$2.50; \$7.50 − \$2.50 = \$5, the net price.
The net cost = 24 × \$5, or \$120.
The total discount = 24 × \$2.50, or \$60.

12. The discount on 1 fishing rod $= 12\frac{1}{2}\%$, or $\frac{1}{8}$, of \$1.60 = \$.20; \$1.60 − \$.20 = \$1.40, the net price.
The net cost = 36 × \$1.40, or \$50.40.
The total discount = 36 × \$.20, or \$7.20.

13. The discount on 1 hunting knife = 20%, or $\frac{1}{5}$, of \$1.75 = \$.35; \$1.75 − \$.35 = \$1.40, the net price.
The net cost = 30 × \$1.40, or \$42.
The total discount = 30 × \$.35, or \$10.50.

Page 205

14. The discount = 20%, or $\frac{1}{5}$, of \$32.50 = \$6.50;
\$32.50 − \$6.50 = \$26, the net price.

15. The discount = 50%, or $\frac{1}{2}$, of \$41.50 = \$20.75.

16. The discount $= 33\frac{1}{3}\%$, or $\frac{1}{3}$, of \$22.50 = \$7.50;
\$22.50 − \$7.50 = \$15, the net price.

17. The discount = 40%, or $\frac{2}{5}$, of \$16.25 = \$6.50;
He paid \$16.25 − \$6.50, or \$9.75.

18. The discount = 30%, or .30, of \$18.50 = \$5.55;
\$18.50 − \$5.55 = \$12.95, the selling price.

19. The discount on 1 camera = 15%, or .15, of \$25 = \$3.75;
\$25 − \$3.75 = \$21.25, the net price;
Then, the net cost = 9 × \$21.25, or \$191.25.

20. The discount = 25%, or $\frac{1}{4}$, of \$27 = \$6.75;
He paid \$27 − \$6.75, or \$20.25.

21. $220 \times 7\frac{1}{2}$¢ = \$16.50, the cost without discount;
The discount = 10%, or .10, of \$16.50 = \$1.65;
\$16.50 − \$1.65 = \$14.85, the cash cost.

22. 3 × 100 gross = 300 gross; 300 × 5¢ = \$15, the cost without discount;
20%, or $\frac{1}{5}$, of \$15 = \$3, the discount;
Then, the net cost = \$15 − \$3, or \$12.

23. 3 doz. = 3 × 12, or 36; 36 × \$2.25 = \$81, the cost without discount;
$16\frac{2}{3}\%$, or $\frac{1}{6}$, of \$81 = \$13.50, the discount.

24. $3600 \times 6\frac{3}{4}$¢ = \$243, the cost without discount;
3%, or .03, of \$243 = \$7.29, the discount;
\$243 − \$7.29 = \$235.71, the net cost.

25. 250 × \$.22 = \$55 ; 40%, or $\frac{2}{5}$, of \$55 = \$22, the discount;
His bill = \$55 − \$22, or \$33.
5%, or .05, of \$33 = \$1.65, the second discount.
Then, he had to pay \$33 − \$1.65, or \$31.35.

26. The discount per bushel = $62\frac{1}{2}$%, or $\frac{5}{8}$, of \$.72 = \$.45;
The net price per bushel = \$.72 − \$.45, or \$.27 ;
42,000 lb. ÷ 60 lb. = 700, the number of bushels.
Then, the net cost = 700 × \$.27, or \$189.

Page 206

1. $4\frac{1}{2}$ bu. = $4\frac{1}{2}$ times 4 pk., or 18 pk. = 18 × 8 qt., or 144 qt.
The amount sown per acre = 144 qt. ÷ 72, or 2 qt.

2. The entire weight = $4\frac{1}{2}$ × 50 lb., or 225 lb.

3. 225 lb. ÷ 100 lb. = 2.25 ; 2.25 × \$7.40 = \$16.65, the cost of the seed.

4. 72 × \$2.50 = \$180, the cost of thrashing.

5. 9 ft. 8 in. = 9 × 12 in., or 108 in., + 8 in. = 116 in.;
116 in. ÷ 4 in. = 29, the number of shelves.

6. 20.7 T. = 20.7 × 2000 lb., or 41,400 lb.;
41,400 lb. ÷ 120 = 345 lb., the average weight of a bale.

7. 20.7 T. = 41,400 lb.; 41,400 lb. ÷ 72 = 575 lb., the quantity per acre.

8. Since 72 A. produced 120 bales, 1 A. produced 120 bales ÷ 72, or $1\frac{2}{3}$ bales.
Since $1\frac{2}{3}$, or $\frac{5}{3}$, bales were produced on 1 A., $\frac{1}{3}$ of a bale would be produced on $\frac{1}{5}$ A., and $\frac{3}{3}$, or 1, bale on 3 × $\frac{1}{5}$ A., or $\frac{3}{5}$ A.; hence, $\frac{3}{5}$, or 60%, of an acre's yield was used in making 1 bale.

9. 20.7 × \$35 = \$724.50, the total expense.

10. At $4\frac{3}{4}$¢ per pound, 41,400 lb. brought 41,400 × $4\frac{3}{4}$¢, or \$1966.50.
The owner gained \$1966.50 − \$724.50 = \$1242.

Page 207

11. At $4\frac{3}{4}$¢ per pound, 1 T. would bring 2000 × $4\frac{3}{4}$¢, or \$95; hence, he would have made \$95 − \$90, or \$5 less per ton.

12. 20.7 × 100 doz. brooms = 2070 doz. brooms.
2070 doz. brooms = 2070 × 12, or 24,840, brooms; then, each bale made 24,840 brooms ÷ 120, or 207 brooms.

13. Since 30,320 T. was $66\frac{2}{3}$%, or $\frac{2}{3}$, of the total amount, $\frac{1}{3}$ was $\frac{1}{2}$ of 30,320 T. = 15,160 T., and $\frac{3}{3}$, or all, was 3 × 15,160 T. = 45,480 T.

14. 120 ft. = 120 × 12 in. = 1440 in.; as many times 4 pieces of spawn were used as 8 in. is contained times in 1440 in.; that is, 1440 in. ÷ 8 in., or 180; 180 × 4 pieces = 720 pieces, the quantity of spawn used.

15. The side beds held 6 × 720 pieces, or 4320 pieces.
Each middle bed held 2 × 720 pieces, or 1440 pieces; then,
The 4 middle beds held 4 × 1440 pieces, or 5760 pieces;
4320 pieces + 5760 pieces = 10,080 pieces, the spawn used.

16. 10,080 pieces ÷ 12 pieces = 840, the number of bricks required.

Page 208

17. 840 × $1\frac{1}{4}$ lb. = 1050 lb., the weight of the spawn;
$157.50 ÷ 1050 = $.15, its cost per pound.

18. Since 10,080 pieces of spawn were required, as many bricks would have been used as 9 is contained times in 10,080; that is, 10,080 ÷ 9, or 1120; 1120 bricks − 840 bricks, or 280 bricks more, would have been used.

19. The 280 additional bricks weighed 280 × $1\frac{1}{4}$ lb., or 350 lb.;
350 lb. would have cost 350 × 15¢, or $52.50, more.

20. 5040 × $\frac{3}{8}$ lb. = 1890 lb., the yield of mushrooms.

21. $33\frac{1}{3}$%, or $\frac{1}{3}$, of 1890 lb. = 630 lb.;
630 lb. ÷ 10 lb. = 63, the number of baskets of choice mushrooms.

22. 50%, or $\frac{1}{2}$, of 1890 lb. = 945 lb.;
945 lb. ÷ 3 lb. = 315, the number of baskets holding 3 lb.

23. 630 lb. + 945 lb. = 1575 lb.; 1890 lb. − 1575 lb. = 315 lb., the remainder;
315 lb. ÷ 5 lb. = 63, the number of 5-lb. baskets.

24. He paid 630 × 65¢, or $409.50.

25. $378 ÷ 315 = $1.20, the price per basket;
$1.20 ÷ 3 = $.40, the price per pound.

26. 315 lb. ÷ 5 lb. = 63, the number of 5-lb. baskets;
63 × $2.25 = $141.75, the amount received for them.

27. The total receipts = $409.50 + $378 + $141.75 = $929.25.

28. 17,500 × $3\frac{1}{2}$¢ = $612.50, the cost of the shells.

Page 209

29. The quantity of seed oysters = 250 × 35 bbl., or 8750 bbl.

30. 8750 × $1.25 = $10,937.50, the cost of the seed.

31. 35 × 15,000 oysters = 525,000 oysters, the seed per acre;
250 × 525,000 oysters = 131,250,000 oysters, the seed on the whole farm.

32. 32 % + 6 %, or 38 %, were lost; then,
38 %, or .38, of 131,250,000 = 49,875,000, the number lost.

33. 84 %, or .84, of 81,375,000 = 68,355,000, the number gathered.

34. 3¾ millions = 3,750,000; 3,750,000 ÷ 12 = 312,500, the number of dozen; 312,500 × 11¢ = $34,375;
4½ millions = 4,500,000; 4,500,000 ÷ 12 = 375,000, the number of dozen; 375,000 × 9¢ = $33,750.
Then, $34,375 + $33,750, or $68,125, was received for them.

35. 15,000 bbl. contained 15,000 × 1400, or 21,000,000, oysters; 21,000,000 ÷ 100 = 210,000; then, 210,000 × 37½¢ = $78,750, received for second-grade oysters.

36. 39,105,000 × ¼¢ = $97,762.50, received for the rest.

37. The total receipts = $68,125 + $78,750 + $97,762.50 = $244,637.50.

Page 210

38. 1368 oysters ÷ 48 oysters = 28½, the number of quarts;
28½ × 40¢ = $11.40, the sum received;
$11.40 − $6.84 = $4.56, the gain.

39. He sowed as many acres as 2½ bu. is contained times in 225 bu.; that is, 225 bu. ÷ 2½ bu., or 90; hence, he sowed 90 A.

40. The total depth = 18.72 in. + 9.35 in., or 28.07 in.
The useful depth = 28.07 in. − 15.68 in., or 12.39 in.

41. 2 reapers cut 2 × 11.25 A., or 22.5 A., per day; then it took as many days to reap 90 A. as 22.5 is contained times in 90; that is, 90 ÷ 22.5, or 4; hence, it took 4 days.

42. 900 sacks ÷ 90 = 10 sacks, the number per acre.

43. 10 × 162 lb. = 1620 lb., the weight of the rough rice per acre;
1620 lb. ÷ 45 lb. = 36, the yield in bushels per acre.

44. 90 × 36 bu. = 3240 bu., the yield from the whole field.

45. He paid 90 × 2 sacks, or 180 sacks; 180 sacks ÷ 900 sacks = .20; that is, 180 sacks is 20 % of 900 sacks; hence, he paid 20 % of his crop for rent.
He had left 100 % − 20 %, or 80 %, of his crop.

46. He paid 20 %, or ⅕, of 3240 bu. = 648 bu.
He had left 3240 bu. − 648 bu., or 2592 bu.

Page 211

47. 2592 × 85¢ = $2203.20, the amount received.

48. 90 × $17.88 = $1609.20, the expense.

49. $2203.20 − $1609.20 = $594, the profit.

50. 2592 × 45 lb. = 116,640 lb., the quantity sold at the mill.

51. 100 lb. is $\frac{100}{162}$ of 162 lb.; that is, the cleaned rice weighed $\frac{100}{162}$ as much as the rough rice; then, the cleaned rice = $\frac{100}{162}$ of 116,640 lb., or 72,000 lb.

52. 116,640 lb. = 116,640 ÷ 162, or 720, sacks; 720 ÷ 648 = $1\frac{1}{9}$; that is, 720 is $1\frac{1}{9}$ times 648; then, since it took 12 hr. to mill 648 sacks of rice, to mill 720 sacks it took $1\frac{1}{9}$ × 12 hr., or $13\frac{1}{3}$ hr.

53. The cleaned rice weighed 116,640 lb. − 72,000 lb., or 44,640 lb., less.

54. 23,328 lb. ÷ 116,640 lb. = .20; that is, 23,328 lb. is 20% of 116,640 lb.
Hence, 20% of the rough rice consisted of hulls.

55. The bran and polish weighed 44,640 lb. − 23,328 lb., or 21,312 lb., = 21,312 ÷ 2000, or 10.656, T.; then, 10.656 × $15 = $159.84, the sum received.

56. The broken rice weighed 23%, or .23, of 72,000 lb. = 16,560 lb.
The whole rice weighed 72,000 lb. − 16,560 lb., or 55,440 lb.

57. 55,440 × $5\frac{3}{4}$¢ = $3187.80, the value of the unbroken rice.

58. $414 ÷ 16,560 = $.025, or $2\frac{1}{2}$¢, the price per pound.

59. 297,900,000 lb. ÷ 331,000,000 lb. = .90; that is, 297,900,000 lb. is 90% of 331,000,000 lb.; hence, these states produced 90% of the whole crop.

60. $3\frac{1}{4}$ mi. = $3\frac{1}{4}$ × 320 rd., or 1040 rd.;
1040 × $1.05 = $1092, the expense.

Page 212

61. He planted $\frac{1}{3}$ of 14,550 cuttings, or 4850 cuttings.

62. The sum of the monthly receipts = $2250;
$187.50 ÷ $2250 = .$08\frac{1}{3}$; that is, $187.50 is $8\frac{1}{3}$% of $2250.
Hence, the receipts for October were $8\frac{1}{3}$% of the total receipts.
$236.25 ÷ $2250 = .105; that is, $236.25 is $10\frac{1}{2}$% of $2250.
Hence, the receipts for November were $10\frac{1}{2}$% of the total receipts.
$337.50 ÷ $2250 = .15; that is, $337.50 is 15% of $2250.
Hence, the receipts for December were 15% of the total receipts.
$405 ÷ $2250 = .18; that is, $405 is 18% of $2250.
Hence, the receipts for January were 18% of the total receipts.
$375 ÷ $2250 = .$16\frac{2}{3}$; that is, $375 is $16\frac{2}{3}$% of $2250.
Hence, the receipts for February were $16\frac{2}{3}$% of the total receipts.
The receipts for March were the same as for December.
$281.25 ÷ $2250 = .125; that is, $281.25 is $12\frac{1}{2}$% of $2250.
Hence, the receipts for April were $12\frac{1}{2}$% of the total receipts.
$90 ÷ $2250 = .04; that is, $90 is 4% of $2250.
Hence, the receipts for May were 4% of the total receipts.

63. In October as many times 100 violets were sold as $1 is contained times in $187.50; $187.50 ÷ $1 = 187.5; 187.5 × 100 violets = 18,750 violets.

In November as many times 100 violets were sold as $1 is contained times in $236.25; $236.25 ÷ $1 = 236.25; 236.25 × 100 violets = 23,625 violets.

In December as many times 100 violets were sold as $2 is contained times in $337.50; $337.50 ÷ $2 = 168.75; 168.75 × 100 violets = 16,875 violets.

In January as many times 100 violets were sold as $1.50 is contained times in $405; $405 ÷ $1.50 = 270; 270 × 100 violets = 27,000 violets.

In February as many times 100 violets were sold as $1 is contained times in $375; $375 ÷ $1 = 375; 375 × 100 violets = 37,500 violets.

In March as many times 100 violets were sold as $.75 is contained times in $337.50; $337.50 ÷ $.75 = 450; 450 × 100 violets = 45,000 violets.

In April as many times 100 violets were sold as $.75 is contained times in $281.25; $281.25 ÷ $.75 = 375; 375 × 100 violets = 37,500 violets.

In May as many times 100 violets were sold as $.75 is contained times in $90; $90 ÷ $.75 = 120; 120 × 100 violets = 12,000 violets.

Adding the several months' sales, the total number = 218,250.

64. 218,250 violets ÷ 4850 = 45 violets, the average per plant.

65. 218,250 ÷ 100 = 2182.5; 2182.5 × 8¢ = $174.60, expressage.

66. Since $174.60 was $33\frac{1}{3}\%$, or $\frac{1}{3}$, of the entire expense, $\frac{3}{3}$, or the whole expense = 3 × $174.60, or $523.80.

67. The gain = $2250 − $523.80, or $1726.20.

Page 214

1. Gold is weighed by troy weight, cotton by avoirdupois; then, 1 lb. of cotton weighs 7000 gr. − 5760 gr., or 1240 gr., more than 1 lb. of gold.

2. 1 av. lb. = 7000 gr.; since there are 16 oz. in 1 av. lb., 1 av. oz. contains $\frac{1}{16}$ of 7000 gr., or $437\frac{1}{2}$ gr.

3. 437.5 gr. ÷ 480 gr. = .911+; that is, 437.5 gr. is .911+ of 480 gr.
Hence, 1 av. oz. is .911+ of 1 troy oz.

4. 3 × 50 oz. = 150 oz.; 5 × 25 oz. = 125 oz.; 3 × 15 oz. = 45 oz.; then,
100 oz. + 150 oz. + 125 oz. + 45 oz. = 420 oz.; since 16 av. oz. = 1 lb., the number of pounds he bought = 420 oz. ÷ 16 oz., or 26 lb. and 4 oz. over.

5. 4000 × 5 gr. = 20,000 gr.; 4000 × 3 gr. = 12,000 gr.; 12,000 × 2 gr. = 24,000 gr.

The quantity to be used = 20,000 gr. + 12,000 gr. + 24,000 gr. = 56,000 gr.; since 7000 gr. = 1 av. lb., the number of pounds of quinine to be used = 56,000 gr. ÷ 7000 gr., or 8 lb.

8 av. lb. = 8 × 16 oz., or 128 oz.; 128 oz. cost 128 × $26\frac{1}{2}$¢, or $33.92.

6. 30 T. 875 lb. = 30 × 2000 lb., or 60,000 lb., + 875 lb. = 60,875 lb.; 60,875 × \$.0845 = \$5143.9375; hence, he received \$5143.94.

7. 1 long ton = 2240 lb.; 840 lb. is $\frac{840}{2240}$, or $\frac{3}{8}$, of 1 long ton.
Then, $12\frac{3}{8}$ T. of pig iron cost $12\frac{3}{8}$ × \$18.40, or \$227.70.

8. 5 T. 635 lb. = 5 × 2000 lb., or 10,000 lb., + 635 lb. = 10,635 lb.; at \$1.10 per 100 lb., 10,635 lb. of oats sold for 106.35 × \$1.10 = \$116.985, or \$116.99.

9. 1 lb. (troy), or 12 oz., of gold is worth 12 × \$20.67183, or \$248.06196.

10. 5 lb. 8 oz. (troy) = 5 × 12 oz., or 60 oz., + 8 oz. = 68 oz.
The value of 68 oz. = 68 × 66¢, or \$44.88.

11. 2 lb. 10 oz. (troy) = 2 × 12 oz., or 24 oz., + 10 oz. = 34 oz.
The value of 34 oz. = 34 × 66¢ = \$22.44.

12. 1 oz. = 20 pwt.; then, 5 pwt. is $\frac{5}{20}$, or $\frac{1}{4}$, oz.
The value of $4\frac{1}{4}$ oz. = $4\frac{1}{4}$ × 66¢ = \$2.80$\frac{1}{2}$.

13. 1 oz. = 20 pwt.; then, 4 pwt. is $\frac{4}{20}$, or $\frac{1}{5}$, oz.
The value of $11\frac{1}{5}$ oz. = $11\frac{1}{5}$ × 66¢ = \$7.392, or \$7.39.

14. 2 lb. = 2 × 12 oz., or 24 oz.; since 1 oz. = 20 pwt., 3 pwt. is $\frac{3}{20}$ oz.
Then, 2 lb. 10 oz. 3 pwt. = 24 oz. + 10 oz. + $\frac{3}{20}$ oz. = $34\frac{3}{20}$ oz.
The value of $34\frac{3}{20}$ oz. = $34\frac{3}{20}$ × 66¢ = \$22.539, or \$22.54.

15. Since 1 pwt. = 24 gr., 16 pwt. = 16 × 24 gr., or 384 gr.; 384 gr. + $12\frac{1}{2}$ gr. = $396\frac{1}{2}$ gr.; $396\frac{1}{2}$ gr. ÷ 480 gr. = .826+; that is, $396\frac{1}{2}$ gr. is .826+ of 1 oz.; then, 1 lb. 16 pwt. $12\frac{1}{2}$ gr. = 12.826+ oz.

The value of 12.826+ oz. = 12.826+ × 66¢ = \$8.46516+, or \$8.47.

16. The silver weighs $\frac{9}{10}$ of $412\frac{1}{2}$ gr., or $\frac{1485}{4}$ gr.; $\frac{1485}{4}$ gr. ÷ 480 gr. = $\frac{99}{128}$; that is, $\frac{1485}{4}$ gr. is $\frac{99}{128}$ of 480 gr., or 1 oz.; since silver is worth 64¢ per oz., the bullion value of a silver dollar = $\frac{99}{128}$ of 64¢, or $49\frac{1}{2}$¢.

17. 2 oz. 5 pwt. = 2 × 20 pwt., or 40 pwt., + 5 pwt. = 45 pwt.;
6 lb. 4 oz. = 6 × 12 oz., or 72 oz., + 4 oz. = 76 oz.; 76 oz. 10 pwt. = 76 × 20 pwt., or 1520 pwt., + 10 pwt. = 1530 pwt.

Then, as many spoons weighing 2 oz. 5 pwt. each can be made from 6 lb. 4 oz. 10 pwt. of silver as 45 pwt. is contained times in 1530 pwt.; that is, since 1530 pwt. ÷ 45 pwt. = 34, 34 spoons can be made.

Page 215

18. Since 1 pwt. = 24 gr., $21\frac{1}{2}$ pwt. = $21\frac{1}{2}$ × 24 gr., or 516 gr.; then, a double eagle contains $\frac{9}{10}$ of 516 gr., or 464.4 gr., of pure gold.

19. The pure gold in a double eagle weighs $\frac{9}{10}$ of $21\frac{1}{2}$ pwt., or 19.35 pwt.; since 19.35 pwt. are worth \$20, 1 pwt. is worth \$20 ÷ 19.35 = \$1.03359+, or \$1.0336.

20. Since \$20 is the value of 19.35 pwt. [solution Ex. 19] of pure gold, \$1 is the value of $\frac{1}{20}$ of 19.35 pwt., or .9675 pwt.

21. 1 lb. 2 oz. (troy) = 14 oz. = 14 × 20 pwt., or 280 pwt.;
280 × \$1.03 = \$288.40, the cost.

22. Since 1 double eagle, or \$20, weighs $21\frac{1}{2}$ pwt., \$5000 in gold coin weighs as many times $21\frac{1}{2}$ pwt. as \$20 is contained times in \$5000; that is, \$5000 in gold weighs 250 × $21\frac{1}{2}$ pwt. = 5375 pwt.; since 20 pwt. = 1 oz., 5375 pwt. = (5375 ÷ 20) oz., or $268\frac{3}{4}$ oz.; since 12 oz. (troy) = 1 lb., $268\frac{3}{4}$ oz. = ($268\frac{3}{4}$ ÷ 12) lb., or 22 lb. and $4\frac{3}{4}$ oz. over; hence, \$5000 in gold coin weighs 22 lb. $4\frac{3}{4}$ oz. (troy).

23. \$5000 in gold weighs 22 lb. $4\frac{3}{4}$ oz. (Ex. 22); \$15,000 ÷ \$5,000 = 3; that is, \$15,000 is 3 times \$5000; then, \$15,000 in gold weighs 3 × 22 lb. $4\frac{3}{4}$ oz., or 67 lb. $2\frac{1}{4}$ oz. (troy).

24. Since a double eagle weighs $21\frac{1}{2}$ pwt., the allowable loss of weight = $\frac{1}{2}$%, or .005, of $21\frac{1}{2}$ pwt. = .1075 pwt.; then, the least weight that will be received = 21.5 pwt. − .1075 pwt. = 21.3925 pwt.

25. When a double eagle has lost $\frac{3}{4}$% in weight, it has lost $\frac{3}{4}$% in value; $\frac{3}{4}$%, or .0075, of \$20 = \$.15, the loss in value; then, this double eagle is worth \$20 − \$.15, or \$19.85.

26. 1 double eagle, or \$20 in gold, weighs $21\frac{1}{2}$ pwt.; \$1,000,000 ÷ \$20 = 50,000; that is, \$1,000,000 is 50,000 times \$20; then, \$1,000,000 weighs 50,000 × $21\frac{1}{2}$ pwt., or 1,075,000 pwt.; since 20 pwt. = 1 oz., 1,075,000 pwt. = (1,075,000 ÷ 20) oz., or 53,750 oz.; since 12 oz. (troy) = 1 lb., 53,750 oz. = (53,750 ÷ 12) lb., or $4{,}479\frac{1}{6}$ lb.; hence, \$1,000,000 in gold weighs $4{,}479\frac{1}{6}$ lb. (troy).

27. Since \$20 in gold weighs $21\frac{1}{2}$ pwt., \$1 weighs $\frac{1}{20}$ of $21\frac{1}{2}$ pwt., or 1.075 pwt., = 1.075 × 24 gr., or 25.8 gr.; 188 pwt. 3 gr. = 188 × 24 gr., or 4512 gr., + 3 gr. = 4515 gr.; since 25.8 gr. are worth \$1, 4515 gr. are worth as many dollars as 25.8 is contained times in 4515, or \$175, the loss.

\$175 ÷ \$1,000,000 = .000175; that is, \$175 is .0175%, or $.01\frac{3}{4}$%, of \$1,000,000; hence, the loss was $.01\frac{3}{4}$%.

28. .48 × \$20 = \$9.60, the total value of the gold;
25 × 65¢ = \$16.25, the total value of the silver;
\$9.60 + \$16.25 = \$25.85, the total value of both;
\$25.85 ÷ 17 = \$1.52+, the value per ton.

29. 7 lb. 10 oz. (troy) = 7 × 12 oz., or 84 oz., + 10 oz. = 94 oz.;
\$1814 ÷ 94 = \$19.298−, the value per ounce.

Page 216

1. The volume = (120 × 4 × 4) cu. ft. = 1920 cu. ft.; since 1 cord = 128 cu. ft., the number of cords in 1920 cu. ft. is 1920 ÷ 128, or 15 cords.

2. The volume = $(76 \times 6 \times 4)$ cu. ft. = 1824 cu. ft.; since 1 cord = 128 cu. ft., the number of cords in 1824 cu. ft. is $1824 \div 128$, or $14\frac{1}{4}$ cords.

3. $\frac{1}{4}$ mi. = $\frac{1}{4}$ of 5280 ft., or 1320 ft.; the volume = $(1320 \times 8 \times 4)$ cu. ft. = 42,240 cu. ft.; since 1 cord = 128 cu. ft., the number of cords in 42,240 cu. ft. is $42{,}240 \div 128$, or 330 cords.

4. The volume = $(8 \times 4\frac{1}{2} \times 4)$ cu. ft. = 144 cu. ft.; since 1 cord = 128 cu. ft., the number of cords in 144 cu. ft. = $144 \div 128$, or $1\frac{1}{8}$ cords.

5. Since 1 gal., or 4 qt. = 231 cu. in., 1 qt. (liquid measure) = $\frac{1}{4}$ of 231 cu. in., or $57\frac{3}{4}$ cu. in.

Since 1 bu., or 32 qt. = 2150.42 cu. in., 1 qt. (dry measure) = 2150.42 cu. in. $\div 32 = 67.200625$, or $67\frac{1}{5}+$ cu. in.

6. The volume of the bin = $(7 \times 7 \times 80)$ cu. ft. = 3920 cu. ft.; since 1 bu. = $1\frac{1}{4}$ cu. ft., the number of bushels in 3920 cu. ft. is $3920 \div 1\frac{1}{4}$, or 3136 bu.

7. The volume of the vat = $(11 \times 4 \times 3\frac{1}{2})$ cu. ft. = 154 cu. ft. = 154×1728 cu. in., or 266,112 cu. in.; since 1 gal. = 231 cu. in., the number of gallons of milk in 266,112 cu. in. is $266{,}112 \div 231$, or 1152 gal.

Page 217

8. 8 ft. 4 in. = $8\frac{1}{3}$ ft.; the cubical contents = $(36 \times 8\frac{1}{3} \times 8)$ cu. ft. = 2400 cu. ft.

9. Since 1 bu. = $1\frac{1}{4}$ cu. ft., the number of bushels in 2400 cu. ft. is $2400 \div 1\frac{1}{4}$, or 1920 bu.; 1920×32 lb. = 61,440 lb., the amount it would contain.

10. It is 80,000 lb. − 61,440 lb., or 18,560 lb., less.

11. Since 1 bu. = $1\frac{1}{4}$ cu. ft., the number of bushels of wheat in 2400 cu. ft. is $2400 \div 1\frac{1}{4}$, or 1920 bu.; the wheat would weigh 1920×60 lb., or 115,200 lb.; then, the load would exceed the capacity allowed by 115,200 lb. − 80,000 lb., or 35,200 lb.

12. The car being 36 ft. long and $8\frac{1}{3}$ ft. wide, the volume of wheat would be $(36 \times 8\frac{1}{3} \times 1)$ cu. ft. = 300 cu. ft.; since 1 bu. = $1\frac{1}{4}$ cu. ft., the number of bushels of wheat would be $300 \div 1\frac{1}{4}$, or 240 bu.

13. Since 1 bu. of wheat weighs 60 lb., the number of bushels in 80,000 lb. of wheat = $80{,}000 \div 60$, or $\frac{4000}{3}$ bu.; since [Ex. 12] the car contains 240 bu. when filled to a height of 1 ft., to contain $\frac{4000}{3}$ bu. it must be filled to a height of $\frac{4000}{3} \div 240$, or $5\frac{5}{9}$, ft.

14. 1200 bu. of shelled corn weigh 1200×56 lb., or 67,200 lb.;
35,000 lb. + 67,200 lb. = 102,200 lb., the weight of the loaded car.

15. 200 × 2 bu., or 400 bu., of clover seed weigh 400 × 60 lb. = 24,000 lb.;
80 × 200 lb. = 16,000 lb., the weight of the bran;
225 × 60 lb. = 13,500 lb., the weight of the potatoes; then,
The weight of the car and its load = 35,000 lb. + 24,000 lb. + 16,000 lb. + 13,500 lb. = 88,500 lb.

16. The 4 bbl., filled, weighed 347 lb. + 342 lb. + 348 lb. + 340 lb. = 1377 lb.
The 4 bbl., empty, weighed 25 lb. + 24 lb. + 25 lb. + 23 lb. = 97 lb.
Then, 1377 lb. – 97 lb. = 1280 lb., the weight of the sugar.
At $4.25 per 100 lb., 1280 lb. of sugar cost 12.8 × $4.25, or $54.40.

Page 218

17. The weight = 16 × 196 lb., or 3136 lb.
The cost = 16 × $4.75, or $76.

18. The weight = 20 × 280 lb., or 5600 lb.
The cost = 20 × $1.15, or $23.

19. The weight = 120 × 200 lb., or 24,000 lb.
The cost = 120 × $12.80, or $1536.

20. The weight = 275 lb. + 280 lb., or 555 lb.
The cost = 555 × 13½¢ = $74.92½, or $74.93.

21. The weight = 250 lb. + 290 lb. + 260 lb. = 800 lb.
The cost at $7.55 per 100 lb. = 8 × $7.55, or $60.40.

22. The gain per gallon = 50¢ – 38¢, or 12¢.
The total gain = 49 × 12¢, or $5.88.

23. The amount received = 52 × 14¢, or $7.28.
The gain = $7.28 – $5.75, or $1.53.

24. The gain per gallon = 90¢ – 67½¢, or 22½¢.
The total gain = 50 × 22½¢, or $11.25.

25. The amount received = 50 × 25¢, or $12.50.
The gain = $12.50 – $5.25, or $7.25.

26. The gain per gallon = 75¢ – 58¢, or 17¢.
The total gain = 47 × 17¢, or $7.99.

27. The gain per gallon = 35¢ – 28½¢, or 6½¢.
The total gain = 50 × 6½¢, or $3.25.

28. 2¾ bu. = 2¾ × 4 pk., or 11 pk.; the amount received = 11 × 20¢, or $2.20.
The gain = $2.20 – $1.60, or $.60.

29. Since 32 qt. = 1 bu., the selling price per bushel = 32 × 5¢, or $1.60.
Then, the gain per bushel = $1.60 – $1.40, or $.20.
The gain on 4 × 4 bu., or 16 bu. = 16 × $.20, or $3.20.

30. Since 30 lb. are in a box, the selling price per box = 30 × 10¢, or $3.
Then, the gain per box = $3 – $2.50, or $.50.
The gain on 6 boxes = 6 × $.50, or $3.

31. Since 30 doz. are in a case, the selling price per case = 30 × 26¢, or $7.80.
Then, the gain per case = $7.80 – $6.45, or $1.35.
The gain on 7 cases = 7 × $1.35, or $9.45.

32. The gain per pound = 27¢ – $22\frac{1}{2}$¢, or $4\frac{1}{2}$¢.
The gain on 8 × 60 lb., or 480 lb. = 480 × $4\frac{1}{2}$¢, or $21.60.

33. The gain per pound = 12¢ – $9\frac{1}{2}$¢, or $2\frac{1}{2}$¢.
The gain on 12 × 25 lb., or 300 lb. = 300 × $2\frac{1}{2}$¢, or $7.50.

34. The gain per bag = $1.45 – $1.25, or $.20;

18 T. = 18 × 2000 lb., or 36,000 lb.; the number of 100-lb. bags required to hold 36,000 lb. of meal is 36,000 ÷ 100, or 360 bags.

The gain on 360 bags = 360 × $.20, or $72.

35. Since 20 cwt. = 1 T., the selling price per ton = 20 × $1.10, or $22.
Then, the gain per ton = $22 – $19, or $3.
The total gain = 12 × $3, or $36.

Page 219

1. The volume of the first cistern = ($6 \times 6 \times 10\frac{1}{2}$) cu. ft. = 378 cu. ft.
Since 1 cu. ft. = $7\frac{1}{2}$ gal., 378 cu. ft. = 378 × $7\frac{1}{2}$ gal., or 2835 gal.

Since 1 bbl. of water = $31\frac{1}{2}$ gal., the number of barrels in 2835 gal. = 2835 ÷ $31\frac{1}{2}$, or 90 bbl.

The volume of the second cistern = ($16 \times 8\frac{3}{4} \times 7\frac{1}{2}$) cu. ft. = 1050 cu. ft.
Since 1 cu. ft. = $7\frac{1}{2}$ gal., 1050 cu. ft. = 1050 × $7\frac{1}{2}$ gal., or 7875 gal.

Since 1 bbl. of water = $31\frac{1}{2}$ gal., the number of barrels in 7875 gal. = 7875 ÷ $31\frac{1}{2}$, or 250 bbl.

2. Since 1 cu. ft. = $7\frac{1}{2}$ gal., the number of cubic feet in 7500 gal. = 7500 ÷ $7\frac{1}{2}$, or 1000 cu. ft.

Since 1 bbl. of water = $31\frac{1}{2}$ gal., the number of barrels in 7500 gal. = 7500 ÷ $31\frac{1}{2}$, or $238\frac{2}{21}$ bbl.

3. Since 1 cu. ft. = $7\frac{1}{2}$ gal., the number of million cubic feet in $18\frac{3}{4}$ million gal. of water = $18\frac{3}{4} \div 7\frac{1}{2}$, or $2\frac{1}{2}$ million cu. ft.

4. The total area of the filters = 8 × 30,000 sq. ft., or 240,000 sq. ft.
The depth of water, 110 in. = 110 ÷ 12, or $9\frac{1}{6}$, ft.; then,

The volume of water filtered = ($240{,}000 \times 9\frac{1}{6}$) cu. ft., or 2,200,000 cu. ft.

Since 1 cu. ft. = $7\frac{1}{2}$ gal., the number of gallons filtered per day = 2,200,000 × $7\frac{1}{2}$ gal., or 16,500,000 gal.

5. The area drained $= 8240 \times 27{,}878{,}400$ sq. ft., or 229,718,016,000 sq. ft.; since 40 in. $= 40 \div 12$, or $3\frac{1}{3}$ ft., the volume of water $= (3\frac{1}{3} \times 229{,}718{,}016{,}000)$ cu. ft., or 765,726,720,000 cu. ft.; since 1 cu. ft. $= 7\frac{1}{2}$ gal., 765,726,720,000 cu. ft. $= 765{,}726{,}720{,}000 \times 7\frac{1}{2}$ gal., or 5,742,950,400,000 gal.; hence, the quantity of water, to the nearest million gallons, is 5,742,950 million gal.

6. Since 1 gal. of fresh water weighs $8\frac{1}{3}$ lb., 1 gal. of Dead Sea water weighs $1.24 \times 8\frac{1}{3}$ lb., or $10\frac{1}{3}$ lb.

7. 600 gal. of water weigh $600 \times 8\frac{1}{3}$ lb., or 5000 lb.; since milk is 1.03 times as heavy as water, 600 gal. of milk weigh 1.03×5000 lb., or 5150 lb.

8. 30 in. $= 2\frac{1}{2}$ ft.; 12 in. $= 1$ ft.; then, the volume of the block of ice $= (2 \times 2\frac{1}{2} \times 1)$ cu. ft. $= 5$ cu. ft.; 5 cu. ft. of water weigh $5 \times 62\frac{1}{2}$ lb., or $312\frac{1}{2}$ lb.; then, 5 cu. ft. of ice weigh $.92 \times 312\frac{1}{2}$ lb., or $287\frac{1}{2}$ lb.

Page 220

9. 1 cu. ft. of water $= 62\frac{1}{2}$ lb.; $163\frac{3}{4}$ lb. $\div 62\frac{1}{2}$ lb. $= 2.62$; that is, $163\frac{3}{4}$ lb. is 2.62 times $62\frac{1}{2}$ lb.; hence, the first kind of marble was 2.62 times as heavy.

$184\frac{3}{8}$ lb. $\div 62\frac{1}{2}$ lb. $= 2.95$; that is, $184\frac{3}{8}$ lb. is 2.95 times $62\frac{1}{2}$ lb.; hence, the second kind of marble was 2.95 times as heavy.

10. Since 1 cu. ft. of water weighs $62\frac{1}{2}$ lb., 1 cu. ft. of cork weighs $.24 \times 62\frac{1}{2}$ lb., or 15 lb.

11. 30 in. $= 2\frac{1}{2}$ ft.; the volume of the corner stone $= (4 \times 4 \times 2\frac{1}{2})$ cu. ft., or 40 cu. ft.; 40 cu. ft. of water weigh $40 \times 62\frac{1}{2}$ lb., or 2500 lb.; then, 40 cu. ft. of granite weigh 2.72×2500 lb., or 6800 lb.

12. The volume of the plate $= (90 \times 56 \times \frac{3}{8})$ cu. in. $= 1890$ cu. in. $= \frac{1890}{1728}$ cu. ft.; since 1 cu. ft. of water weighs $62\frac{1}{2}$ lb., and steel is 7.84 times as heavy as water, 1 cu. ft. of steel weighs $7.84 \times 62\frac{1}{2}$ lb., or 490 lb.; then, $\frac{1890}{1728}$ cu. ft. of steel plate weigh $\frac{1890}{1728} \times 490$ lb., or $535\frac{15}{16}$ lb.

13. 1 cu. ft. of water weighs $62\frac{1}{2}$ lb.;
1 cu. ft. of lead weighs $11.35 \times 62\frac{1}{2}$ lb., or $709\frac{3}{8}$ lb.;
1 cu. ft. of tin weighs $7.28 \times 62\frac{1}{2}$ lb., or 455 lb.; then,
1 cu. ft. of lead weighs $709\frac{3}{8}$ lb. $-$ 455 lb., or $254\frac{3}{8}$ lb., more.

Page 223

1. Since the thickness is $2''$, and the width $12''$, or $1'$, each piece contains $(2 \times 1 \times 12)$ ft., or 24 ft.; and 24 pieces contain 24×24 ft., or 576 ft.

2. Since the thickness is $2''$, and the width $6''$, or $\frac{1}{2}'$, each piece contains $(2 \times \frac{1}{2} \times 14)$ ft., or 14 ft.; and 15 pieces contain 15×14 ft., or 210 ft.

3. Since the thickness is $2''$, and the width $4''$, or $\frac{1}{3}'$, each piece contains $(2 \times \frac{1}{3} \times 10)$ ft., or $6\frac{2}{3}$ ft.; and 250 pieces contain $250 \times 6\frac{2}{3}$ ft., or $1666\frac{2}{3}$ ft.

4. Since the thickness is $3''$, and the width $8''$, or $\frac{2}{3}'$, each piece contains $(3 \times \frac{2}{3} \times 16)$ ft., or 32 ft.; and 112 pieces contain 112×32 ft., or 3584 ft.

5. Since the thickness is $2''$, and the width $8''$, or $\frac{2}{3}'$, each piece contains $(2 \times \frac{2}{3} \times 14)$ ft., or $\frac{56}{3}$ ft.; and 64 pieces contain $64 \times \frac{56}{3}$ ft., or $1194\frac{2}{3}$ ft.

6. Since the thickness is $2''$, and the width $12''$, or $1'$, each piece contains $(2 \times 1 \times 12)$ ft., or 24 ft.; and 80 pieces contain 80×24 ft., or 1920 ft.

7. Since the thickness is $4''$, and the width $6''$, or $\frac{1}{2}'$, each piece contains $(4 \times \frac{1}{2} \times 18)$ ft., or 36 ft.; and 125 pieces contain 125×36 ft., or 4500 ft.

8. Since the thickness is $6''$, and the width $8''$, or $\frac{2}{3}'$, each piece contains $(6 \times \frac{2}{3} \times 18)$ ft., or 72 ft.; and 75 pieces contain 75×72 ft., or 5400 ft.

9. Since the thickness is $4''$, and the width $8''$, or $\frac{2}{3}'$, each piece contains $(4 \times \frac{2}{3} \times 12)$ ft., or 32 ft.; and 48 pieces contain 48×32 ft., or 1536 ft.

10. Since the thickness is $7''$, and the width $9''$, or $\frac{3}{4}'$, each piece contains $(7 \times \frac{3}{4} \times 11)$ ft., or $\frac{231}{4}$ ft.; and 84 pieces contain $84 \times \frac{231}{4}$ ft., or 4851 ft.

11. Since the thickness is $6''$, and the width $14''$, or $\frac{7}{6}'$, each piece contains $(6 \times \frac{7}{6} \times 14)$ ft., or 98 ft.; and 112 pieces contain 112×98 ft., or 10,976 ft.

12. Since the thickness is $8''$, and the width $16''$, or $\frac{4}{3}'$, each piece contains $(8 \times \frac{4}{3} \times 20)$ ft., or $\frac{640}{3}$ ft.; and 96 pieces contain $96 \times \frac{640}{3}$ ft., or 20,480 ft.

13. Adding, the sum of the several quantities above $= 56{,}894\frac{1}{3}$ ft.

At \$24 per 1000 ft., $56{,}894\frac{1}{3}$ ft. cost $56.894\frac{1}{3} \times \$24 = \$1365.464$, or \$1365.47.

14. Sills $= (4 \times \frac{2}{3} \times 200)$ ft. $= 533\frac{1}{3}$ ft.; girder $= (8 \times 1 \times 30)$ ft. $= 240$ ft.; 7 posts $= 7 \times (4 \times \frac{2}{3} \times 22)$ ft. $= 410\frac{2}{3}$ ft.; 2 posts $= 2 \times (4 \times \frac{2}{3} \times 18)$ ft. $= 96$ ft.; beams $= (3 \times \frac{2}{3} \times 84)$ ft. $= 168$ ft.; then,

The total amount of lumber $= 533\frac{1}{3}$ ft. $+ 240$ ft. $+ 410\frac{2}{3}$ ft. $+ 96$ ft. $+ 168$ ft. $= 1448$ ft.; at \$21 per M, 1448 ft. cost $1.448 \times \$21 = \$30.408$, or \$30.41.

15. Plates $= (4 \times \frac{1}{2} \times 100)$ ft. $= 200$ ft.; ties $= (4 \times \frac{1}{2} \times 340)$ ft. $= 680$ ft.; ridge $= (3 \times 1 \times 28)$ ft. $= 84$ ft.; 45 beams $= 45 \times (3 \times \frac{2}{3} \times 22)$ ft. $= 1980$ ft.; 24 rafters $= 24 \times (2 \times \frac{2}{3} \times 20)$ ft. $= 640$ ft.; then,

The total amount of lumber $= 200$ ft. $+ 680$ ft. $+ 84$ ft. $+ 1980$ ft. $+ 640$ ft. $= 3584$ ft.; at \$21 per M, 3584 ft. cost $3.584 \times \$21 = \$75.264$, or \$75.27.

16. Sills $= (6 \times \frac{2}{3} \times 250)$ ft. $= 1000$ ft.; plates $= (4 \times \frac{1}{2} \times 250)$ ft. $= 500$ ft.; ties $= (4 \times \frac{1}{2} \times 325)$ ft. $= 650$ ft.; girders $= (8 \times 1 \times 46)$ ft. $= 368$ ft.; 10 posts $= 10 \times (4 \times \frac{2}{3} \times 24)$ ft. $= 640$ ft.; then,

The total amount of lumber $= 1000$ ft. $+ 500$ ft. $+ 650$ ft. $+ 368$ ft. $+ 640$ ft. $= 3158$ ft.; at \$21 per M, 3158 ft. cost $3.158 \times \$21 = \$66.318$, or \$66.32.

17. 70 joists = 70 × (2 × $\frac{5}{6}$ × 22) ft. = $2566\frac{2}{3}$ ft.; 20 joists = 20 × (2 × $\frac{5}{6}$ × 15) ft. = 500 ft.; 8 joists = 8 × (2 × $\frac{5}{6}$ × 13) ft. = $173\frac{1}{3}$ ft.; purlins = (4 × $\frac{1}{2}$ × 240) ft. = 480 ft.; beams = (3 × $\frac{2}{3}$ × 200) ft. = 400 ft.; then,

The total amount of lumber = $2566\frac{2}{3}$ ft. + 500 ft. + $173\frac{1}{3}$ ft. + 480 ft. + 400 ft. = 4120 ft.; at $21 per M, 4120 ft. cost 4.120 × $21 = $86.52.

Page 224

18. 440 studs contain 440 × (2 × $\frac{1}{3}$ × 12) ft. = 3520 ft.; at $20 per M, 3520 ft. cost 3.520 × $20 = $70.40.

19. 320 rafters contain 320 × (2 × $\frac{5}{6}$ × 18) ft. = 9600 ft.; at $22 per M, 9600 ft. cost 9.600 × $22 = $211.20.

20. 8 girders contain 8 × (8 × 1 × 28) ft. = 1792 ft.; at $28 per M, 1792 ft. cost 1.792 × $28 = $50.176, or $50.18.

21. 800 boards contain 800 × (1 × $\frac{2}{3}$ × 12) ft. = 6400 ft.; at $17 per M, 6400 ft. cost 6.400 × $17 = $108.80.

22. 640 × $2\frac{1}{2}$¢ = $16, the cost of the molding.

23. At $36 per M, 6250 ft. cost 6.250 × $36 = $225.

24. 6 posts contain 6 × (4 × $\frac{2}{3}$ × 36) ft. = 576 ft.; at $30 per M, 576 ft. cost .576 × $30 = $17.28.

25. The total length of boards = 5 × 64 rd., or 320 rd. = 320 × $16\frac{1}{2}$ ft., or 5280 ft.; since the boards are 1 in. thick and 6 in., or $\frac{1}{2}$ ft., wide, they contain (1 × $\frac{1}{2}$ × 5280) board feet = 2640 ft.; at $20 per M, 2640 ft. cost 2.640 × $20 = $52.80.

26. Since the pieces are laid the long way of the room, and the room is 15′, or 180″, wide, as many pieces $2\frac{1}{2}$″ wide are required as $2\frac{1}{2}$ is contained times in 180; that is, 180 ÷ $2\frac{1}{2}$, or 72 pieces.

27. The boards being less than 1″ thick, 72 pieces 3″, or $\frac{1}{4}$′ wide, and 16′ long, contain 72 × (1 × $\frac{1}{4}$ × 16) ft. = 288 ft.; at $54 per M, 288 ft. cost .288 × $54 = $15.552, or $15.56.

28. 38 joists = 38 × (2 × 1 × 24) ft. = 1824 ft., which cost 1.824 × $25 = $45.60; 160 boards = 160 × (1 × $\frac{7}{12}$ × 12) ft. = 1120 ft., which cost 1.120 × $16 = $17.92; 38 strips 24′ long = 38 × 24′ = 912′, which cost 912 × 2¢ = $18.24; 30 strips = 30 × (2 × $\frac{1}{4}$ × 15) ft. = 225 ft., which cost .225 × $22 = $4.95; 64 boards = 64 × ($1\frac{1}{4}$ × $\frac{3}{4}$ × 26) ft. = 1560 ft., which cost 1.560 × $30 = $46.80.

The total cost of the materials = $45.60 + $17.92 + $18.24 + $4.95 + $46.80 + $3.65 = $137.16.

29. It contained (7 × 24 × 5) ft. = 840 ft.

30. The cubic contents of the plank = (24 × 5 × $\frac{7}{12}$) cu. ft. = 70 cu. ft; 2050 lb. ÷ 70 = $29\frac{2}{7}$ lb., the weight per cubic foot.

4. Since the thickness is 3″, and the width 8″, or $\frac{2}{3}'$, each piece contains $(3 \times \frac{2}{3} \times 16)$ ft., or 32 ft.; and 112 pieces contain 112×32 ft., or 3584 ft.

5. Since the thickness is 2″, and the width 8″, or $\frac{2}{3}'$, each piece contains $(2 \times \frac{2}{3} \times 14)$ ft., or $\frac{56}{3}$ ft.; and 64 pieces contain $64 \times \frac{56}{3}$ ft., or $1194\frac{2}{3}$ ft.

6. Since the thickness is 2″, and the width 12″, or 1′, each piece contains $(2 \times 1 \times 12)$ ft., or 24 ft.; and 80 pieces contain 80×24 ft., or 1920 ft.

7. Since the thickness is 4″, and the width 6″, or $\frac{1}{2}'$, each piece contains $(4 \times \frac{1}{2} \times 18)$ ft., or 36 ft.; and 125 pieces contain 125×36 ft., or 4500 ft.

8. Since the thickness is 6″, and the width 8″, or $\frac{2}{3}'$, each piece contains $(6 \times \frac{2}{3} \times 18)$ ft., or 72 ft.; and 75 pieces contain 75×72 ft., or 5400 ft.

9. Since the thickness is 4″, and the width 8″, or $\frac{2}{3}'$, each piece contains $(4 \times \frac{2}{3} \times 12)$ ft., or 32 ft.; and 48 pieces contain 48×32 ft., or 1536 ft.

10. Since the thickness is 7″, and the width 9″, or $\frac{3}{4}'$, each piece contains $(7 \times \frac{3}{4} \times 11)$ ft., or $\frac{231}{4}$ ft.; and 84 pieces contain $84 \times \frac{231}{4}$ ft., or 4851 ft.

11. Since the thickness is 6″, and the width 14″, or $\frac{7}{6}'$, each piece contains $(6 \times \frac{7}{6} \times 14)$ ft., or 98 ft.; and 112 pieces contain 112×98 ft., or 10,976 ft.

12. Since the thickness is 8″, and the width 16″, or $\frac{4}{3}'$, each piece contains $(8 \times \frac{4}{3} \times 20)$ ft., or $\frac{640}{3}$ ft.; and 96 pieces contain $96 \times \frac{640}{3}$ ft., or 20,480 ft.

13. Adding, the sum of the several quantities above $= 56{,}894\frac{1}{3}$ ft.

At \$24 per 1000 ft., $56{,}894\frac{1}{3}$ ft. cost $56.894\frac{1}{3} \times \$24 = \$1365.464$, or \$1365.47.

14. Sills $= (4 \times \frac{2}{3} \times 200)$ ft. $= 533\frac{1}{3}$ ft.; girder $= (8 \times 1 \times 30)$ ft. $= 240$ ft.; 7 posts $= 7 \times (4 \times \frac{2}{3} \times 22)$ ft. $= 410\frac{2}{3}$ ft.; 2 posts $= 2 \times (4 \times \frac{2}{3} \times 18)$ ft. $=$ 96 ft.; beams $= (3 \times \frac{2}{3} \times 84)$ ft. $= 168$ ft.; then,

The total amount of lumber $= 533\frac{1}{3}$ ft. $+ 240$ ft. $+ 410\frac{2}{3}$ ft. $+ 96$ ft. $+ 168$ ft. $= 1448$ ft.; at \$21 per M, 1448 ft. cost $1.448 \times \$21 = \$30.408$, or \$30.41.

15. Plates $= (4 \times \frac{1}{2} \times 100)$ ft. $= 200$ ft.; ties $= (4 \times \frac{1}{2} \times 340)$ ft. $= 680$ ft.; ridge $= (3 \times 1 \times 28)$ ft. $= 84$ ft.; 45 beams $= 45 \times (3 \times \frac{2}{3} \times 22)$ ft. $= 1980$ ft.; 24 rafters $= 24 \times (2 \times \frac{2}{3} \times 20)$ ft. $= 640$ ft.; then,

The total amount of lumber $= 200$ ft. $+ 680$ ft. $+ 84$ ft. $+ 1980$ ft. $+ 640$ ft. $= 3584$ ft.; at \$21 per M, 3584 ft. cost $3.584 \times \$21 = \$75.264$, or \$75.27.

16. Sills $= (6 \times \frac{2}{3} \times 250)$ ft. $= 1000$ ft.; plates $= (4 \times \frac{1}{2} \times 250)$ ft. $= 500$ ft.; ties $= (4 \times \frac{1}{2} \times 325)$ ft. $= 650$ ft.; girders $= (8 \times 1 \times 46)$ ft. $= 368$ ft.; 10 posts $= 10 \times (4 \times \frac{2}{3} \times 24)$ ft. $= 640$ ft.; then,

The total amount of lumber $= 1000$ ft. $+ 500$ ft. $+ 650$ ft. $+ 368$ ft. $+ 640$ ft. $= 3158$ ft.; at \$21 per M, 3158 ft. cost $3.158 \times \$21 = \$66.318$, or \$66.32.

17. 70 joists = 70 × (2 × $\frac{5}{6}$ × 22) ft. = 2566$\frac{2}{3}$ ft.; 20 joists = 20 × (2 × $\frac{5}{6}$ × 15) ft. = 500 ft.; 8 joists = 8 × (2 × $\frac{5}{6}$ × 13) ft. = 173$\frac{1}{3}$ ft.; purlins = (4 × $\frac{1}{2}$ × 240) ft. = 480 ft.; beams = (3 × $\frac{2}{3}$ × 200) ft. = 400 ft.; then,

The total amount of lumber = 2566$\frac{2}{3}$ ft. + 500 ft. + 173$\frac{1}{3}$ ft. + 480 ft. + 400 ft. = 4120 ft.; at $21 per M, 4120 ft. cost 4.120 × $21 = $86.52.

Page 224

18. 440 studs contain 440 × (2 × $\frac{1}{3}$ × 12) ft. = 3520 ft.; at $20 per M, 3520 ft. cost 3.520 × $20 = $70.40.

19. 320 rafters contain 320 × (2 × $\frac{5}{6}$ × 18) ft. = 9600 ft.; at $22 per M, 9600 ft. cost 9.600 × $22 = $211.20.

20. 8 girders contain 8 × (8 × 1 × 28) ft. = 1792 ft.; at $28 per M, 1792 ft. cost 1.792 × $28 = $50.176, or $50.18.

21. 800 boards contain 800 × (1 × $\frac{2}{3}$ × 12) ft. = 6400 ft.; at $17 per M, 6400 ft. cost 6.400 × $17 = $108.80.

22. 640 × 2$\frac{1}{2}$¢ = $16, the cost of the molding.

23. At $36 per M, 6250 ft. cost 6.250 × $36 = $225.

24. 6 posts contain 6 × (4 × $\frac{2}{3}$ × 36) ft. = 576 ft.; at $30 per M, 576 ft. cost .576 × $30 = $17.28.

25. The total length of boards = 5 × 64 rd., or 320 rd. = 320 × 16$\frac{1}{2}$ ft., or 5280 ft.; since the boards are 1 in. thick and 6 in., or $\frac{1}{2}$ ft., wide, they contain (1 × $\frac{1}{2}$ × 5280) board feet = 2640 ft.; at $20 per M, 2640 ft. cost 2.640 × $20 = $52.80.

26. Since the pieces are laid the long way of the room, and the room is 15′, or 180″, wide, as many pieces 2$\frac{1}{2}$″ wide are required as 2$\frac{1}{2}$ is contained times in 180; that is, 180 ÷ 2$\frac{1}{2}$, or 72 pieces.

27. The boards being less than 1″ thick, 72 pieces 3″, or $\frac{1}{4}$′ wide, and 16′ long, contain 72 × (1 × $\frac{1}{4}$ × 16) ft. = 288 ft.; at $54 per M, 288 ft. cost .288 × $54 = $15.552, or $15.56.

28. 38 joists = 38 × (2 × 1 × 24) ft. = 1824 ft., which cost 1.824 × $25 = $45.60; 160 boards = 160 × (1 × $\frac{7}{12}$ × 12) ft. = 1120 ft., which cost 1.120 × $16 = $17.92; 38 strips 24′ long = 38 × 24′ = 912′, which cost 912 × 2¢ = $18.24; 30 strips = 30 × (2 × $\frac{1}{4}$ × 15) ft. = 225 ft., which cost .225 × $22 = $4.95; 64 boards = 64 × (1$\frac{1}{4}$ × $\frac{3}{4}$ × 26) ft. = 1560 ft., which cost 1.560 × $30 = $46.80.

The total cost of the materials = $45.60 + $17.92 + $18.24 + $4.95 + $46.80 + $3.65 = $137.16.

29. It contained (7 × 24 × 5) ft. = 840 ft.

30. The cubic contents of the plank = (24 × 5 × $\frac{7}{12}$) cu. ft. = 70 cu. ft; 2050 lb. ÷ 70 = 29$\frac{2}{7}$ lb., the weight per cubic foot.

Page 225

1. Since 100 laths = 1 bundle, 2000 laths = 20 bundles; 20 × 10¢ = $2, the cost of this labor; lath nails cost 10 × 6¢ = 60¢; sand cost 5 × 90¢ = $4.50; common lime cost 4 × $1 = $4; plaster cost $1\frac{1}{2}$ × 25¢ = $37\frac{1}{2}$¢, or 38¢; mason cost $1\frac{1}{2}$ × $3.50 = $5.25; helper cost $1\frac{1}{2}$ × $2 = $3; laborer cost $\frac{1}{2}$ × $1.50 = $.75.

The items, in order = $4.50 + $2 + $.60 + $4.50 + $4 + $1.50 + $.38 + $.50 + $5.25 + $3 + $.75 + $1 + $2.20 = $30.18; 10%, or .10, of $30.18 = $3.018; $30.18 + $3.018 = $33.198, or $33.20, cost of 100 sq. yd.; $33.20 ÷ 100 = 33.2¢, cost of one sq. yd.

2. The distance round the room = 2 × (16 ft. + 14 ft.) = 60 ft.; then,

The total area of the walls = (9 × 60) sq. ft. = 540 sq. ft.

The area of the ceiling = (16 × 14) sq. ft. = 224 sq. ft.

The area of walls and ceiling = 540 sq. ft. + 224 sq. ft. = 764 sq. ft.

The deductions are: 2 windows $3\frac{1}{2}'$ by 6′, or 42 sq. ft.; and 2 doors 3′ by 7′, or 42 sq. ft.; 42 sq. ft. + 42 sq. ft. = 84 sq. ft.

The total area, less deductions = 764 sq. ft. − 84 sq. ft., or 680 sq. ft. = (680 ÷ 9) sq. yd., or $75\frac{5}{9}$ sq. yd.; then,

$75\frac{5}{9}$ × 35¢ = $\$26.44\frac{4}{9}$, or $26.45, the cost.

3. From the solution of Ex. 2, the area of the walls = 540 sq. ft., and the deductions = 84 sq. ft.; 540 sq. ft. − 84 sq. ft. = 456 sq. ft. = (456 ÷ 9) sq. yd., or $50\frac{2}{3}$ sq. yd.;

$50\frac{2}{3}$ × 30¢ = $15.20, the cost of painting.

The area of the ceiling, 224 sq. ft. = (224 ÷ 9) sq. yd., or $24\frac{8}{9}$ sq. yd.;

$24\frac{8}{9}$ × 10¢ = $\$2.48\frac{8}{9}$, or $2.49, the cost for tinting;

$15.20 + $2.49 = $17.69, the total cost.

Page 226

4. The area of the 2 sides = 2 × (27 × 78) sq. ft. = 4212 sq. ft.

The area of the 2 ends up to the eaves = 2 × (27 × 32) sq. ft. = 1728 sq. ft.

Since the ends above the eaves form triangles, and the height of each triangle is 39′ − 27′, or 12′, the area of each triangle = $\frac{1}{2}$ of (12 × 32) sq. ft. = 192 sq. ft.; and the area of both triangles = 2 × 192 sq. ft. = 384 sq. ft.

The total area of sides and ends = 4212 sq. ft. + 1728 sq. ft. + 384 sq. ft. = 6324 sq. ft. = (6324 ÷ 9) sq. yd., or $702\frac{2}{3}$ sq. yd.;

$702\frac{2}{3}$ × $12\frac{1}{2}$¢ = $\$87.83\frac{1}{3}$, or $87.84, the cost.

5. The area of the roof = 2 × (22 × 81) sq. ft., or 3564 sq. ft. = (3564 ÷ 9) sq. yd., or 396 sq. yd.;

396 × 16¢ = $63.36, the cost.

6. The distance round the room = $2 \times (17\frac{1}{2}' + 16') = 67'$; then,
The total area of the walls = (67×10) sq. ft. = 670 sq. ft.
The area of the ceiling = $(17\frac{1}{2} \times 16)$ sq. ft. = 280 sq. ft.
The area of walls and ceiling = 670 sq. ft. + 280 sq. ft., or 950 sq. ft.;
950 sq. ft. = $(950 \div 9)$ sq. yd. = 105.6^- sq. yd.
The deductions are: 3 doors = 3×1.2 sq. yd., or 3.6 sq. yd.; and 4 windows = $4 \times .9$ sq. yd., or 3.6 sq. yd.; 3.6 sq. yd. + 3.6 sq. yd. = 7.2 sq. yd.
The total area, less deductions = 105.6 sq. yd. − 7.2 sq. yd., or 98.4 sq. yd.;
98.4×32¢ = \$31.488, or \$31.49, the cost.

7. The distance round the room = $2 \times (14\frac{1}{2}' + 14') = 57$ ft.; then,
The total area of the walls = (57×10) sq. ft. = 570 sq. ft.
The area of the ceiling = $(14\frac{1}{2} \times 14)$ sq. ft. = 203 sq. ft.
The area of walls and ceiling = 570 sq. ft. + 203 sq. ft., or 773 sq. ft.;
773 sq. ft. = $(773 \div 9)$ sq. yd. = 85.9^- sq. yd.
The deductions are: 4 doors = 4×1.2 sq. yd., or 4.8 sq. yd.; and 3 windows = $3 \times .9$ sq. yd., or 2.7 sq. yd.; 4.8 sq. yd. + 2.7 sq. yd. = 7.5 sq. yd.
The total area, less deductions = 85.9 sq. yd. − 7.5 sq. yd. = 78.4 sq. yd.;
78.4×32¢ = \$25.088, or \$25.09, the cost.

8. The distance round the room = $2 \times (11\frac{1}{12}' + 14') = 50\frac{1}{6}$ ft.; then,
The total area of the walls = $(50\frac{1}{6} \times 10)$ sq. ft. = $501\frac{2}{3}$ sq. ft.
The area of the ceiling = $(11\frac{1}{12} \times 14)$ sq. ft. = $155\frac{1}{6}$ sq. ft.
The area of walls and ceiling = $501\frac{2}{3}$ sq. ft. + $155\frac{1}{6}$ sq. ft., or $656\frac{5}{6}$ sq. ft.;
$656\frac{5}{6}$ sq. ft. = $(656\frac{5}{6} \div 9)$ sq. yd. = 73.0^- sq. yd.
The deductions are: 4 doors = 4×1.2 sq. yd., or 4.8 sq. yd.; and 1 window = .9 sq. yd.; 4.8 sq. yd. + .9 sq. yd. = 5.7 sq. yd.
The total area, less deductions = 73 sq. yd. − 5.7 sq. yd., or 67.3 sq. yd.;
67.3×32¢ = \$21.536, or \$21.54, the cost.

9. Figuring each room separately:
The distance round the room = $2 \times (13\frac{1}{12}' + 10') = 46\frac{1}{6}'$; then,
The total area of the walls = $(46\frac{1}{6} \times 10)$ sq. ft. = $461\frac{2}{3}$ sq. ft.
The area of the ceiling = $(13\frac{1}{12} \times 10)$ sq. ft. = $130\frac{5}{6}$ sq. ft.
The area of walls and ceiling = $461\frac{2}{3}$ sq. ft. + $130\frac{5}{6}$ sq. ft. = $592\frac{1}{2}$ sq. ft.;
$592\frac{1}{2}$ sq. ft. = $(592\frac{1}{2} \div 9)$ sq. yd. = $65.8+$ sq. yd.
The deductions are: 2 doors = 2×1.2 sq. yd., or 2.4 sq. yd.; and 1 window = .9 sq. yd.; 2.4 sq. yd. + .9 sq. yd. = 3.3 sq. yd.
The total area, less deductions = 65.8 sq. yd. − 3.3 sq. yd., or 62.5 sq. yd.;
62.5×32¢ = \$20 the cost for 1 room;
$2 \times$ \$20 = \$40, the cost for both rooms.

10. The distance round the room $= 2 \times (8\frac{7}{12}' + 9') = 35\frac{1}{6}'$; then,
The total area of the walls $= (35\frac{1}{6} \times 10)$ sq. ft. $= 351\frac{2}{3}$ sq. ft.
The area of the ceiling $= (8\frac{7}{12} \times 9)$ sq. ft. $= 77\frac{1}{4}$ sq. ft.
The area of walls and ceiling $= 351\frac{2}{3}$ sq. ft. $+ 77\frac{1}{4}$ sq. ft. $= 428\frac{11}{12}$ sq. ft.;
$428\frac{11}{12}$ sq. ft. $= (428\frac{11}{12} \div 9)$ sq. yd. $= 47.7^-$ sq. yd.;
The deductions are: 1 door, 1 window $= 1.2$ sq. yd. $+ .9$ sq. yd. $= 2.1$ sq. yd.
The total area, less deductions $= 47.7$ sq. yd. $- 2.1$ sq. yd., or 45.6 sq. yd.;
45.6×32¢ $= \$14.592$, or \$14.60, the cost.

11. The distance round the room $= 2 \times (8\frac{7}{12}' + 5\frac{2}{3}') = 28\frac{1}{2}'$; then,
The total area of the walls $= (28\frac{1}{2} \times 10)$ sq. ft. $= 285$ sq. ft.
The area of the ceiling $= (8\frac{7}{12} \times 5\frac{2}{3})$ sq. ft. $= 48\frac{23}{36}$ sq. ft.
The area of walls and ceiling $= 285$ sq. ft. $+ 48\frac{23}{36}$ sq. ft. $= 333\frac{23}{36}$ sq. ft.;
$333\frac{23}{36}$ sq. ft. $= (333\frac{23}{36} \div 9)$ sq. yd. $= 37.1^-$ sq. yd.
The deductions are: 1 door, 1 window $= 1.2$ sq. yd. $+ .9$ sq. yd. $= 2.1$ sq. yd.
The total area, less deductions $= 37.1$ sq. yd. $- 2.1$ sq. yd., or 35.0 sq. yd.;
35×32¢ $= \$11.20$, the cost.

12. The distance round the hall $= 2 \times (3\frac{7}{12}' + 20\frac{1}{3}') = 47\frac{5}{6}'$; then,
The total area of the walls $= (47\frac{5}{6} \times 10)$ sq. ft. $= 478\frac{1}{3}$ sq. ft.
The area of the ceiling $= (3\frac{7}{12} \times 20\frac{1}{3})$ sq. ft. $= 72\frac{31}{36}$ sq. ft.
The area of walls and ceiling $= 478\frac{1}{3}$ sq. ft. $+ 72\frac{31}{36}$ sq. ft. $= 551\frac{7}{36}$ sq. ft.;
$551\frac{7}{36}$ sq. ft. $= (551\frac{7}{36} \div 9)$ sq. yd. $= 61.2+$ sq. yd.
The deductions are: 8 doors $= 8 \times 1.2$ sq. yd. $= 9.6$ sq. yd.;
The total area, less deductions $= 61.2$ sq. yd. $- 9.6$ sq. yd., or 51.6 sq. yd.;
51.6×32¢ $= \$16.512$, or \$16.52, the cost.

13. The distance round the hall $= 2 \times (3\frac{7}{12}' + 15\frac{3}{4}') = 38\frac{2}{3}'$; then,
The total area of the walls $= (38\frac{2}{3} \times 10)$ sq. ft. $= 386\frac{2}{3}$ sq. ft.
The area of the ceiling $= (3\frac{7}{12} \times 15\frac{3}{4})$ sq. ft. $= 56\frac{7}{16}$ sq. ft.
The area of walls and ceiling $= 386\frac{2}{3}$ sq. ft. $+ 56\frac{7}{16}$ sq. ft. $= 443\frac{5}{48}$ sq. ft.;
$443\frac{5}{48}$ sq. ft. $= (443\frac{5}{48} \div 9)$ sq. yd. $= 49.2+$ sq. yd.

The deductions are: 3 doors $= 3 \times 1.2$ sq. yd., or 3.6 sq. yd.; 1 window $=$ .9 sq. yd.; and 1 skylight $= (6 \times 8)$ sq. ft., or 48 sq. ft. $= (48 \div 9)$ sq. yd. $=$ 5.3+ sq. yd.; 3.6 sq. yd. $+ .9$ sq. yd. $+ 5.3$ sq. yd. $= 9.8$ sq. yd.

The total area, less deductions $= 49.2$ sq. yd. $- 9.8$ sq. yd. $= 39.4$ sq. yd.;
39.4×32¢ $= \$12.608$, or \$12.61, the cost.

14. The distance round the room $= 2 \times (18' + 14') = 64'$; then,
The total area of the walls $= (64 \times 9)$ sq. ft. $= 576$ sq. ft.
The area of the ceiling $= (18 \times 14)$ sq. ft. $= 252$ sq. ft.
The area of walls and ceiling $= 576$ sq. ft. $+ 252$ sq. ft. $= 828$ sq. ft.;

828 sq. ft. $= (828 \div 9)$ sq. yd. $= 92$ sq. yd.; since 1 bundle of lath covers 5 sq. yd. [§ 321], the number of bundles $= 92 \div 5$, or 18.4 bundles.

Hence, 19 bundles of lath must be purchased.

15. The total area = (28 × 54) sq. ft. = 1512 sq. ft.

The deductions are: 14 windows = 14 × (4 × 7) sq. ft., or 392 sq. ft.; and 1 door = (5 × 9) sq. ft., or 45 sq. ft.; 392 sq. ft. + 45 sq. ft. = 437 sq. ft.

The area, less deductions = 1512 sq. ft. – 437 sq. ft. = 1075 sq. ft.;

1075 sq. ft. = (1075 ÷ 9) sq. yd. = $119\frac{4}{9}$ sq. yd.;

$119\frac{4}{9}$ × 20¢ = $$23.88\frac{8}{9}$, or $23.89, the cost.

Page 227

1. The area of the roof = 2 × (22 × 81) sq. ft. = 3564 sq. ft.

The number of squares = 3564 ÷ 100, or 35.64 squares.

The number of shingles used = 35.64 × 1000, or 35,640 shingles.

Since there are 250 shingles to the bunch, the number of bunches used = 35,640 ÷ 250, or $142\frac{14}{25}$ bunches.

Hence, 143 bunches were required.

2. The number of shingles = 143 × 250, or 35,750 shingles.

At $2.20 per M, 35,750 shingles cost 35.750 × $2.20, or $78.65.

3. The area of the roof = 2 × (32 × 50) sq. ft. = 3200 sq. ft.

The number of squares = 3200 ÷ 100, or 32 squares.

Since 1000 shingles are estimated per square, the cost for shingles = 32 × $3.20, or $102.40; hence,

The total cost = $102.40 + $7.50 + $16 = $125.90.

4. From the solution of Ex. 3, the number of squares = 32;

32 × $4.75 = $152, the cost.

5. The width of the roof = 2 × 32′, or 64′ = 64 × 12″, or 768″.

Since there is a lap of 4″, the real width of each strip is 36″ – 4″, or 32″; then,

The number of strips required = 768 ÷ 32, or 24 strips.

6. As many rolls will be required as 3 is contained times in 24; that is, 24 ÷ 3, or 8 rolls; 8 rolls will cost 8 × 60¢, or $4.80.

7. From the solution of Ex. 3, the number of squares = 32; hence, the number of rolls = 32; 32 × $87\frac{1}{2}$¢ = $28, the cost for felt roofing.

8. Roofing nails cost 48 × 4¢, or $1.92; roofing caps cost 32 × $4\frac{1}{2}$¢, or $1.44; 50 gal. roofing cement cost 50 × 13¢, or $6.50; 18 gal. roofing cement cost 18 × 15¢, or $2.70; then,

The whole cost = $4.80 + $28 + $1.92 + $1.44 + $6.50 + $2.70 + $11.20 = $56.56.

9. The number of squares being 32 [solution of Ex. 3], the cost per square = $56.56 ÷ 32 = $$1.76\frac{3}{4}$, or $1.77.

Page 229

1. The distance round the room $= 2 \times (9' + 12') = 42'$; each strip being $18''$, or $1\frac{1}{2}'$, wide, the total number of strips for the walls, disregarding openings $= 42 \div 1\frac{1}{2}$, or 28 strips; allowing for 2 windows, 2×2 strips $= 4$ strips, and for 2 doors, 2×3 strips $= 6$ strips, or 10 strips in all, we find the number of strips used $= 28 - 10$, or 18 strips; since each roll gives 3 strips, the number of rolls required $= 18 \div 3$, or 6 rolls; 6×50¢ $= \$3$, the cost of the wall paper.

With ceiling paper put on the long way of the room, the number of strips used $= 9 \div 1\frac{1}{2}$, or 6 strips; since a roll is 8 yd., or 24 ft., long, the number of strips per roll $= 24 \div 12$, or 2 strips; then, the number of rolls required $= 6 \div 2$, or 3 rolls; 3×40¢ $= \$1.20$, the cost of the ceiling paper.

Since it is 42 ft. around the room, the number of yards of border $= (42 \div 3)$ yd., or 14 yd.; 14×30¢ $= \$4.20$, the cost of the border.

The total cost $= \$3 + \$1.20 + \$4.20 = \$8.40$.

2. The carpet is $\frac{27}{36}$, or $\frac{3}{4}$, yd. wide; since the room is 9 ft., or 3 yd., wide, as many strips are required to lay the carpet the long way of the room as $\frac{3}{4}$ is contained times in 3; that is, $3 \div \frac{3}{4}$, or 4 strips; since the room is 12 ft., or 4 yd., long, the number of yards of carpet required is 4×4, or 16 yd.; $16 \times \$1.40 = \$22.40$, the cost.

3. Each strip was 10 ft., or $\frac{10}{3}$ yd., long.
The area of one strip $= (2 \times \frac{10}{3})$ sq. yd. $= 6\frac{2}{3}$ sq. yd.
The area of the other strip $= (1\frac{1}{2} \times \frac{10}{3})$ sq. yd. $= 5$ sq. yd.;
$6\frac{2}{3}$ sq. yd. $+ 5$ sq. yd. $= 11\frac{2}{3}$ sq. yd., the amount required;
$11\frac{2}{3} \times \$1.10 = \$12.83\frac{1}{3}$, or $\$12.84$, the cost.

4. The distance round the room $= 2 \times (16' + 12') = 56'$; each strip being $18''$, or $1\frac{1}{2}'$, wide, the total number of strips for the walls, disregarding openings $= 56 \div 1\frac{1}{2}$, or $37\frac{1}{3}$, that is, 38 strips; allowing for 3 windows 3×2 strips $= 6$ strips, for 5 doors, 5×3 strips $= 15$ strips, and for the fireplace 3 strips, or 24 strips in all, we find the number of strips used $= 38 - 24$, or 14 strips; since 3 strips are cut from a roll, the number of rolls required $= 14 \div 3$, or $4\frac{2}{3}$ rolls; that is, 5 rolls must be bought; 5×50¢ $= \$2.50$, the cost of the wall paper.

With ceiling paper put on the short way of the room, the number of strips used $= 16 \div 1\frac{1}{2}$, or $10\frac{2}{3}$ strips; that is, 11 strips were necessary; since a roll is 8 yd., or 24 ft., long, the number of strips per roll $= 24 \div 12$, or 2 strips; then the number of rolls required $= 11 \div 2$, or $5\frac{1}{2}$ rolls; the cost of 6 rolls $= 6 \times 40$¢, or $\$2.40$.

Since it is 56 ft. around the room, the number of yards of border $= (56 \div 3)$ yd., or $18\frac{2}{3}$ yd.; $18\frac{2}{3} \times 30$¢ $= \$5.60$, the cost of the border.

The total cost $= \$2.50 + \$2.40 + \$5.60 = \$10.50$.

Page 230

1. The distance round the room $= 2 \times (9' + 12') = 42'$; then,
The total area of the walls $= (42 \times 9\frac{1}{4})$ sq. ft. $= 388\frac{1}{2}$ sq. ft.
The area of the ceiling $= (9 \times 12)$ sq. ft. $= 108$ sq. ft.
The area of walls and ceiling $= 388\frac{1}{2}$ sq. ft. $+ 108$ sq. ft. $= 496\frac{1}{2}$ sq. ft.;
$496\frac{1}{2}$ sq. ft. $= (496\frac{1}{2} \div 9)$ sq. yd. $= 55\frac{1}{6}$ sq. yd.
The deductions are: for 2 windows, 2 sq. yd.; and for 2 doors, 2×2 sq. yd., or 4 sq. yd.; 2 sq. yd. + 4 sq. yd. = 6 sq. yd.
The total area, less deductions $= 55\frac{1}{6}$ sq. yd. $- 6$ sq. yd., or $49\frac{1}{6}$ sq. yd.;
$49\frac{1}{6} \times 30$¢ $=$ \$14.75, the cost for the bedroom.

2. The distance round the room $= 4 \times 10'$, or $40'$; then,
The total area of the walls $= (40 \times 9\frac{1}{4})$ sq. ft. $= 370$ sq. ft.
The area of the ceiling $= (10 \times 10)$ sq. ft. $= 100$ sq. ft.
The area of walls and ceiling $= 370$ sq. ft. $+ 100$ sq. ft. $= 470$ sq. ft.;
470 sq. ft. $= (470 \div 9)$ sq. yd. $= 52\frac{2}{9}$ sq. yd.
The deductions are: for 1 window, 1 sq. yd., and for 3 doors, 3×2 sq. yd., or 6 sq. yd.; in all, 7 sq. yd.
The total area, less deductions $= 52\frac{2}{9}$ sq. yd. $- 7$ sq. yd. $= 45\frac{2}{9}$ sq. yd.;
$45\frac{2}{9} \times 30$¢ $=$ \$$13.56\frac{2}{3}$, or \$13.57, the cost for the kitchen.

3. The distance round the room $= 2 \times (16' + 12') = 56'$; then,
The total area of the walls $= (56 \times 9\frac{1}{4})$ sq. ft. $= 518$ sq. ft.
The area of the ceiling $= (16 \times 12)$ sq. ft. $= 192$ sq. ft.
The area of walls and ceiling $= 518$ sq. ft. $+ 192$ sq. ft. $= 710$ sq. ft.;
710 sq. ft. $= (710 \div 9)$ sq. yd. $= 78\frac{8}{9}$ sq. yd.
The deductions are: for 3 windows, 3 sq. yd., and for 5 doors, 5×2 sq. yd., or 10 sq. yd.; in all, 13 sq. yd.
The total area, less deductions $= 78\frac{8}{9}$ sq. yd. $- 13$ sq. yd. $= 65\frac{8}{9}$ sq. yd.;
$65\frac{8}{9} \times 30$¢ $=$ \$$19.76\frac{2}{3}$, or \$19.77, the cost for the living room.

4. The area of the part $14'$ by $18' = (14 \times 18)$ sq. ft. $= 252$ sq. ft.
The area of the part $14'$ by $27' = (14 \times 27)$ sq. ft. $= 378$ sq. ft.
The total area of the floor $= 252$ sq. ft. $+ 378$ sq. ft. $= 630$ sq. ft.
The volume of concrete 4 in., or $\frac{1}{3}$ ft., deep $= (630 \times \frac{1}{3})$ cu. ft. $= 210$ cu. ft.;
210 cu. ft. $= (210 \div 27)$ cu. yd. $= 7\frac{7}{9}$ cu. yd.;
$7\frac{7}{9} \times$ \$4.25 $=$ \$$33.05\frac{5}{9}$, or \$33.06, the cost.

5. From the solution of Ex. 4 the area of the cellar floor $= 630$ sq. ft.; then,
The cubic contents $= (630 \times 6)$ cu. ft. $= 3780$ cu. ft.;
3780 cu. ft. $= (3780 \div 27)$ cu. yd. $= 140$ cu. yd.;
140×45¢ $=$ \$63, the cost of excavation.

6. $25 \times$ \$8.50 $=$ \$212.50, the cost.

7. 784 × $8.75 = $6860, the value of the red slate;
1515 × $7 = $10,605, the value of the green slate;
$6860 + $10,605 = $17,465, the total value of the output.

8. The length of walks constructed = 32,772 ft. + 14,265 ft. = 47,037 ft.;
47,037 ft. = (47,037 ÷ 3) yd. = 15,679 yd.
The total cost = $26,575 + $10,000 = $36,575;
$36,575 ÷ 15,679 = $2.332⁻, or $2.33, the average cost per lineal yard.

9. 32,772 ft. = (32,772 ÷ 3) yd. = 10,924 yd.;
$26,575 ÷ 10,924 = $2.433⁻, or $2.43, the cost per yard at public expense;
14,265 ft. = (14,265 ÷ 3) yd. = 4755 yd.;
$10,000 ÷ 4755 = $2.103⁺, or $2.10, the cost per yard at private expense.
Then, it cost $2.43 − $2.10, or $.33, more per yard at public expense.

Page 231

10. The area of the floor = (120 × 48) sq. ft. = 5760 sq. ft.; then,
The total weight it could support = 5760 × 150 lb. = 864,000 lb. = (864,000 ÷ 2000) T. = 432 T.

11. Since the area, 24,317,910 sq. yd., was obtained by multiplying the number of yards in length by ¾, the number of yards in width, then the number of yards in length = 24,317,910 ÷ ¾, or 32,423,880 yd.

12. The total area of the roof = 2 × (30 × 20) sq. ft. = 1200 sq. ft.; then,
The total weight of the slate = 1200 × 6¾ lb., or 8100 lb.

13. The width of the lawn less the width of the path = 30 ft. − 3 ft., or 27 ft.; then, every foot of this width took 45 ÷ 9, or 5, strips of sod; and the total number of strips required = 27 × 5, or 135, strips.

14. 8000 ÷ 1333⅓ = 6; that is, 8000 is 6 times 1333⅓; since 1333⅓ ft. of lumber make 4000 strips, 8000 ft. make 6 × 4000 strips, or 24,000 strips.

15. The area of the fence = (6¼ × 78) sq. ft. = 487½ sq. ft.; 487½ ÷ 650 = ¾; that is, 487½ is ¾ of 650; since 1 gal. of paint covers 650 sq. ft., the quantity required to cover 487½ sq. ft. = ¾ gal.

16. The cubic contents of the bin = (12 × 9 × 5⅓) cu. ft. = 576 cu. ft.; hence, the bin contains as many tons of coal as 36 cu. ft. is contained times in 576 cu. ft.; that is, 576 ÷ 36, or 16 T.

17. The space to be occupied = (24 × 20 × 18) cu. ft. = 8640 cu. ft.; hence, as many tons of ice can be packed into a space of 8640 cu. ft. as 40 is contained times in 8640; that is, 8640 ÷ 40, or 216 T.

18. 15 × 1⅔ cu. yd. = 25 cu. yd.; the cost per cubic yard = $21.50 ÷ 25 = $.86.

19. 800 ft. ÷ 50 ft. = 16; 16 × 1¢ = 16¢, the additional cost per cubic yard;
27¢ + 16¢ = 43¢, the total cost per cubic yard;
85 × 43¢ = $36.55, the total cost.

Page 232

20. 15 in. = 1¼ ft.; the volume of the wall = (6 × 36 × 1¼) cu. ft., or 270 cu. ft. = (270 ÷ 27) cu. yd., or 10 cu. yd.; then, the wall contains 10 × 600 bricks, or 6000 bricks.

21. 18 in. = 1½ ft.; the volume of the wall = (30 × 6½ × 1½) cu. ft., or 292½ cu. ft. = (292½ ÷ 27) cu. yd., or 10⅚ cu. yd.; 10⅚ × $7.50 = $81.25, the cost.

22. Since the wall contained 292½ cu. ft. [solution to Ex. 21], the weight per cubic foot = 38,025 lb. ÷ 292½, or 130 lb.

23. The volume excavated = (135 × 102 × 6) cu. ft. = 82,620 cu. ft. = (82,620 ÷ 27) cu. yd., or 3060 cu. yd.; 3060 × 19½¢ = $596.70, the cost.

24. Since, from the solution of Ex. 23, there were 3060 cu. yd. of material, the average car load = 3060 cu. yd. ÷ 40, or 76½ cu. yd.

25. 2½ hr. = 2½ × 60 min., or 150 min. = 150 × 60 sec., or 9000 sec.; 9000 ÷ 40 = 225; that is, 9000 is 225 times 40; since the dredge loaded 6 cu. yd. of mud every 40 sec., in 9000 sec. it loaded 225 × 6 cu. yd., or 1350 cu. yd.

26. ¾ mi. = ¾ of 5280 ft., or 3960 ft.; then, the cubic contents of the trench = (10 × 18 × 3960) cu. ft., or 712,800 cu. ft. = (712,800 ÷ 27) cu. yd., or 26,400 cu. yd.; since the shovel removes 1200 cu. yd. of earth per day, it should take as many days to remove 26,400 cu. yd. as 1200 is contained times in 26,400; that is, 26,400 ÷ 1200, or 22 days.

27. The area of the courtyard = (75 × 50) sq. ft. = 3750 sq. ft.;
3750 sq. ft. = (3750 ÷ 9) sq. yd. = 416⅔ sq. yd.;
416⅔ × $32.70 = $13,625, the cost.

28. From the solution of Ex. 3, the area = 3750 sq. ft.;
3750 × 15¼ lb. = 57,187½ lb., the total weight.

29. ⅝ mi. = ⅝ of 5280 ft. = 3300 ft.; then, the area paved = (3300 × 45) sq. ft., or 148,500 sq. ft. = (148,500 ÷ 9) sq. yd., or 16,500 sq. yd.;
16,500 × $1.96 = $32,340, the cost.

30. 4½ mi. = 4½ × 5280 ft. = 23,760 ft.; then, the total area = (23,760 × 14) sq. ft., or 332.640 sq. ft. = (332,640 ÷ 9) sq. yd., or 36,960 sq. yd.;
36.960 × 50¢ = $18,480, the cost.

31. The area to be sprinkled = (36 × 5,100) sq. ft., or 183,600 sq. ft. = (183,600 ÷ 9) sq. yd., or 20,400 sq. yd.; 20,400 ÷ 850 = 24; that is, 20,400 is 24 times 850; since 850 sq. yd. of pavement req., 60 cu. ft. of water, 20,400 sq. yd. take 24 × 60 cu. ft., or 1440 cu. ft.

Since 1 cu. ft. = 7½ gal., 1440 cu. ft. = 1440 × 7½ gal., or 10,800 gal.

Page 237

13. 99 ÷ 297 = 33⅓; that is, 99 is .33⅓, or 33⅓%, of 297.

14. .66 ÷ 8.25 = .08; that is, .66 is .08, or 8%, of 8.25.

15. 3.4 ÷ 544 = .00625; that is, 3.4 is .00625, or ⅝%, of 544.

16. 216 ÷ 1728 = .125; that is, 216 is .125, or 12½%, of 1728.

17. 784 ÷ 2240 = .35; that is, 784 is .35, or 35%, of 2240.

18. 692 ÷ 4152 = .16⅔; that is, 692 is .16⅔, or 16⅔%, of 4152.

19. $1.68 ÷ $35 = .048; that is, $1.68 is .048, or 4.8%, of $35.

20. $7.92 ÷ $48 = .165; that is, $7.92 is .165, or 16.5%, of $48.

21. $8.40 ÷ $75 = .112; that is, $8.40 is .112, or 11.2%, of $75.

22. Since $306.72 is 3.6%, or .036, of the number, the number = $306.72 ÷ .036, or $8520.

23. Since $465.60 is 75%, or ¾, of the number, ¼ of the number = ⅓ of $465.60 or $155.20, and the number = 4 × $155.20, or $620.80.

24. Since $507.15 is 23%, or .23, of the number, the number = $507.15 ÷ .23, or $2205.

25. Since $812.16 is 4.7%, or .047, of the number, the number = $812.16 ÷ .047, or $17,280.

26. Since $2698.29, is 87½%, or ⅞, of the number, ⅛ of the number = ⅐ of $2698.29, or $385.47, and the number = 8 × $385.47, or $3083.76.

27. Since $4295.25 is 24.9%, or .249, of the number, the number = $4295.25 ÷ .249, or $17,250.

28. Since $6384.90 is 83⅓%, or ⅚, of the number, ⅙ of the number = ⅕ of $6384.90, or $1276.98, and the number = 6 × $1276.98, or $7661.88.

29. Since $7844.62 is 28.63%, or .2863, of the number, the number = $7844.62 ÷ .2863, or $27,400.

30. 27 ÷ 79 = .3418 −; that is, 27 is .3418, or 34.18%, of 79.

31. 69 ÷ 42 = 1.6429 −; that is, 69 is 1.6429, or 164.29%, of 42.

32. 45 ÷ 264 = .1705 −; that is, 45 is .1705, or 17.05%, of 264.

33. 24 ÷ 8.76 = 2.7397 +; that is, 24 is 2.7397, or 273.97%, of 8.76.

34. 28.6 ÷ 46.49 = .6152 −; that is, 28.6 is .6152, or 61.52%, of 46.49.

35. 397 ÷ 629.4 = .6308 −; that is, 397 is .6308, or 63.08%, of 629.4.

36. A long ton contains 73.19%, or .7319, of 2240 lb. = 1639.456 lb.

37. Since 5931 lb. is 65.9%, or .659, of the total weight, the coal weighs 5931 lb. ÷ .659 = 9000 lb.

38. 106 ÷ 153 = .693⁻; that is, 106 is .693, or 69.3 %, of 153.
Hence, the team won 69.3 % of the games played.

39. 171 ÷ 490 = .349⁻; that is, 171 is .349, or 34.9 %, of 490.
Hence, 34.9 % was his batting average.

40. 899 – 15 = 884, the number of successful attempts;
884 ÷ 899 = .983⁺; that is, 884 is .983, or 98.3 %, of 899.
Hence, his fielding average was 98.3 %.

41. $3\frac{2}{5}$ %, or .034, of 6000 = 204, the number of horse vehicles;
$7\frac{1}{2}$ %, or .07$\frac{1}{2}$, of 6000 = 450, the number of street cars;
9.9 %, or .099, of 6000 = 594, the number of motor cars;
$79\frac{1}{5}$ %, or .792, of 6000 = 4752, the number of bicycles.

Page 238

42. 274,447 ÷ 994,762 = .276⁻; that is, 274,447 is .276, or 27.6 %, of 994,762.

Hence, 27.6 % of the pensioners were widows.

43. Since 6434.90 was 22.9 %, or .229, of the cost, the cost = $6434.90 ÷ .229, or $28,100.

44. 50,000 ÷ 270,000 = .185⁺; that is, 50,000 is .185, or 18.5 %, of 270,000.
Hence, 18.5 % could read.

45. 225 × 196 lb. = 44,100 lb., the weight of the flour.

Since 44,100 lb. is 75 %, or $\frac{3}{4}$, of the weight of the wheat used, $\frac{1}{4}$ is $\frac{1}{3}$ of 44,100 lb., or 14,700 lb., and the entire weight = 4 × 14,700 lb., or 58,800 lb.; then,

58,800 lb. ÷ 60 lb. = 980, the number of bushels needed.

46. 151.2 ÷ 432 = .35; that is, 151.2 is .35, or 35 %, of 432.
Hence, 35 % was sand.
146.88 ÷ 432 = .34; that is, 146.88 is .34, or 34 %, of 432.
Hence, 34 % was limestone,
43.2 ÷ 432 = .10; that is, 43.2 is .10, or 10 %, of 432.
Hence, 10 % was soda.
36.72 ÷ 432 = .085; that is, 36.72 is .085, or $8\frac{1}{2}$ %, of 432.
Hence, $8\frac{1}{2}$ % was broken glass.
54 ÷ 432 = .125; that is, 54 is .125, or $12\frac{1}{2}$ %, of 432.
Hence, $12\frac{1}{2}$ % was other substances.

47. Since 25 %, or $\frac{1}{4}$, of the value of his stock was $2125, his stock was worth 4 × $2125, or $8500;

$1275 ÷ $8500 = .15; that is, $1275 is .15, or 15 %, of $8500.
Hence, he lost 15 % of the value.

Page 225

1. Since 100 laths = 1 bundle, 2000 laths = 20 bundles; 20 × 10¢ = $2, the cost of this labor; lath nails cost 10 × 6¢ = 60¢; sand cost 5 × 90¢ = $4.50; common lime cost 4 × $1 = $4; plaster cost $1\frac{1}{2}$ × 25¢ = $37\frac{1}{2}$¢, or 38¢; mason cost $1\frac{1}{2}$ × $3.50 = $5.25; helper cost $1\frac{1}{2}$ × $2 = $3; laborer cost $\frac{1}{2}$ × $1.50 = $.75.

The items, in order = $4.50 + $2 + $.60 + $4.50 + $4 + $1.50 + $.38 + $.50 + $5.25 + $3 + $.75 + $1 + $2.20 = $30.18; 10%, or .10, of $30.18 = $3.018; $30.18 + $3.018 = $33.198, or $33.20, cost of 100 sq. yd.; $33.20 ÷ 100 = 33.2¢, cost of one sq. yd.

2. The distance round the room = 2 × (16 ft. + 14 ft.) = 60 ft.; then,

The total area of the walls = (9 × 60) sq. ft. = 540 sq. ft.

The area of the ceiling = (16 × 14) sq. ft. = 224 sq. ft.

The area of walls and ceiling = 540 sq. ft. + 224 sq. ft. = 764 sq. ft.

The deductions are: 2 windows $3\frac{1}{2}$′ by 6′, or 42 sq. ft.; and 2 doors 3′ by 7′, or 42 sq. ft.; 42 sq. ft. + 42 sq. ft. = 84 sq. ft.

The total area, less deductions = 764 sq. ft. − 84 sq. ft., or 680 sq. ft. = (680 ÷ 9) sq. yd., or $75\frac{5}{9}$ sq. yd.; then,

$75\frac{5}{9}$ × 35¢ = $$26.44\frac{4}{9}$, or $26.45, the cost.

3. From the solution of Ex. 2, the area of the walls = 540 sq. ft., and the deductions = 84 sq. ft.; 540 sq. ft. − 84 sq. ft. = 456 sq. ft. = (456 ÷ 9) sq. yd., or $50\frac{2}{3}$ sq. yd.;

$50\frac{2}{3}$ × 30¢ = $15.20, the cost of painting.

The area of the ceiling, 224 sq. ft. = (224 ÷ 9) sq. yd., or $24\frac{8}{9}$ sq. yd.;

$24\frac{8}{9}$ × 10¢ = $$2.48\frac{8}{9}$, or $2.49, the cost for tinting;

$15.20 + $2.49 = $17.69, the total cost.

Page 226

4. The area of the 2 sides = 2 × (27 × 78) sq. ft. = 4212 sq. ft.

The area of the 2 ends up to the eaves = 2 × (27 × 32) sq. ft. = 1728 sq. ft.

Since the ends above the eaves form triangles, and the height of each triangle is 39′ − 27′, or 12′, the area of each triangle = $\frac{1}{2}$ of (12 × 32) sq. ft. = 192 sq. ft.; and the area of both triangles = 2 × 192 sq. ft. = 384 sq. ft.

The total area of sides and ends = 4212 sq. ft. + 1728 sq. ft. + 384 sq. ft. = 6324 sq. ft. = (6324 ÷ 9) sq. yd., or $702\frac{2}{3}$ sq. yd.;

$702\frac{2}{3}$ × $12\frac{1}{2}$¢ = $$87.83\frac{1}{3}$, or $87.84, the cost.

5. The area of the roof = 2 × (22 × 81) sq. ft., or 3564 sq. ft. = (3564 ÷ 9) sq. yd., or 396 sq. yd.;

396 × 16¢ = $63.36, the cost.

6. The distance round the room $= 2 \times (17\frac{1}{2}' + 16') = 67'$; then,
The total area of the walls $= (67 \times 10)$ sq. ft. $= 670$ sq. ft.
The area of the ceiling $= (17\frac{1}{2} \times 16)$ sq. ft. $= 280$ sq. ft.
The area of walls and ceiling $= 670$ sq. ft. $+ 280$ sq. ft., or 950 sq. ft.;
950 sq. ft. $= (950 \div 9)$ sq. yd. $= 105.6^{-}$ sq. yd.
The deductions are: 3 doors $= 3 \times 1.2$ sq. yd., or 3.6 sq. yd.; and 4 windows $= 4 \times .9$ sq. yd., or 3.6 sq. yd.; 3.6 sq. yd. $+ 3.6$ sq. yd. $= 7.2$ sq. yd.
The total area, less deductions $= 105.6$ sq. yd. $- 7.2$ sq. yd., or 98.4 sq. yd.;
$98.4 \times 32\text{¢} = \$31.488$, or $31.49, the cost.

7. The distance round the room $= 2 \times (14\frac{1}{2}' + 14') = 57$ ft.; then,
The total area of the walls $= (57 \times 10)$ sq. ft. $= 570$ sq. ft.
The area of the ceiling $= (14\frac{1}{2} \times 14)$ sq. ft. $= 203$ sq. ft.
The area of walls and ceiling $= 570$ sq. ft. $+ 203$ sq. ft., or 773 sq. ft.;
773 sq. ft. $= (773 \div 9)$ sq. yd. $= 85.9^{-}$ sq. yd.
The deductions are: 4 doors $= 4 \times 1.2$ sq. yd., or 4.8 sq. yd.; and 3 windows $= 3 \times .9$ sq. yd., or 2.7 sq. yd.; 4.8 sq. yd. $+ 2.7$ sq. yd. $= 7.5$ sq. yd.
The total area, less deductions $= 85.9$ sq. yd. $- 7.5$ sq. yd. $= 78.4$ sq. yd.;
$78.4 \times 32\text{¢} = \$25.088$, or $25.09, the cost.

8. The distance round the room $= 2 \times (11\frac{1}{12}' + 14') = 50\frac{1}{6}$ ft.; then,
The total area of the walls $= (50\frac{1}{6} \times 10)$ sq. ft. $= 501\frac{2}{3}$ sq. ft.
The area of the ceiling $= (11\frac{1}{12} \times 14)$ sq. ft. $= 155\frac{1}{6}$ sq. ft.
The area of walls and ceiling $= 501\frac{2}{3}$ sq. ft. $+ 155\frac{1}{6}$ sq. ft., or $656\frac{5}{6}$ sq. ft.;
$656\frac{5}{6}$ sq. ft. $= (656\frac{5}{6} \div 9)$ sq. yd. $= 73.0^{-}$ sq. yd.
The deductions are: 4 doors $= 4 \times 1.2$ sq. yd., or 4.8 sq. yd.; and 1 window $= .9$ sq. yd.; 4.8 sq. yd. $+ .9$ sq. yd. $= 5.7$ sq. yd.
The total area, less deductions $= 73$ sq. yd. $- 5.7$ sq. yd., or 67.3 sq. yd.;
$67.3 \times 32\text{¢} = \$21.536$, or $21.54, the cost.

9. Figuring each room separately:
The distance round the room $= 2 \times (13\frac{1}{12}' + 10') = 46\frac{1}{6}'$; then,
The total area of the walls $= (46\frac{1}{6} \times 10)$ sq. ft. $= 461\frac{2}{3}$ sq. ft.
The area of the ceiling $= (13\frac{1}{12} \times 10)$ sq. ft. $= 130\frac{5}{6}$ sq. ft.
The area of walls and ceiling $= 461\frac{2}{3}$ sq. ft. $+ 130\frac{5}{6}$ sq. ft. $= 592\frac{1}{2}$ sq. ft.;
$592\frac{1}{2}$ sq. ft. $= (592\frac{1}{2} \div 9)$ sq. yd. $= 65.8+$ sq. yd.
The deductions are: 2 doors $= 2 \times 1.2$ sq. yd., or 2.4 sq. yd.; and 1 window $= .9$ sq. yd.; 2.4 sq. yd. $+ .9$ sq. yd. $= 3.3$ sq. yd.
The total area, less deductions $= 65.8$ sq. yd. $- 3.3$ sq. yd., or 62.5 sq. yd.;
$62.5 \times 32\text{¢} = \$20$ the cost for 1 room;
$2 \times \$20 = \$40$, the cost for both rooms.

10. The distance round the room $= 2 \times (8\frac{7}{12}' + 9') = 35\frac{1}{6}'$; then,
The total area of the walls $= (35\frac{1}{6} \times 10)$ sq. ft. $= 351\frac{2}{3}$ sq. ft.
The area of the ceiling $= (8\frac{7}{12} \times 9)$ sq. ft. $= 77\frac{1}{4}$ sq. ft.
The area of walls and ceiling $= 351\frac{2}{3}$ sq. ft. $+ 77\frac{1}{4}$ sq. ft. $= 428\frac{11}{12}$ sq. ft.;
$428\frac{11}{12}$ sq. ft. $= (428\frac{11}{12} \div 9)$ sq. yd. $= 47.7^-$ sq. yd.;
The deductions are: 1 door, 1 window = 1.2 sq. yd. + .9 sq. yd. = 2.1 sq. yd.
The total area, less deductions = 47.7 sq. yd. – 2.1 sq. yd., or 45.6 sq. yd.;
45.6 × 32¢ = $14.592, or $14.60, the cost.

11. The distance round the room $= 2 \times (8\frac{7}{12}' + 5\frac{2}{3}') = 28\frac{1}{2}'$; then,
The total area of the walls $= (28\frac{1}{2} \times 10)$ sq. ft. $= 285$ sq. ft.
The area of the ceiling $= (8\frac{7}{12} \times 5\frac{2}{3})$ sq. ft. $= 48\frac{23}{36}$ sq. ft.
The area of walls and ceiling $= 285$ sq. ft. $+ 48\frac{23}{36}$ sq. ft. $= 333\frac{23}{36}$ sq. ft.;
$333\frac{23}{36}$ sq. ft. $= (333\frac{23}{36} \div 9)$ sq. yd. $= 37.1^-$ sq. yd.
The deductions are: 1 door, 1 window = 1.2 sq. yd. + .9 sq. yd. = 2.1 sq. yd.
The total area, less deductions = 37.1 sq. yd. – 2.1 sq. yd., or 35.0 sq. yd.;
35 × 32¢ = $11.20, the cost.

12. The distance round the hall $= 2 \times (3\frac{7}{12}' + 20\frac{1}{3}') = 47\frac{5}{6}'$; then,
The total area of the walls $= (47\frac{5}{6} \times 10)$ sq. ft. $= 478\frac{1}{3}$ sq. ft.
The area of the ceiling $= (3\frac{7}{12} \times 20\frac{1}{3})$ sq. ft. $= 72\frac{31}{36}$ sq. ft.
The area of walls and ceiling $= 478\frac{1}{3}$ sq. ft. $+ 72\frac{31}{36}$ sq. ft. $= 551\frac{7}{36}$ sq. ft.;
$551\frac{7}{36}$ sq. ft. $= (551\frac{7}{36} \div 9)$ sq. yd. $= 61.2+$ sq. yd.
The deductions are: 8 doors = 8 × 1.2 sq. yd. = 9.6 sq. yd.;
The total area, less deductions = 61.2 sq. yd. – 9.6 sq. yd., or 51.6 sq. yd.;
51.6 × 32¢ = $16.512, or $16.52, the cost.

13. The distance round the hall $= 2 \times (3\frac{7}{12}' + 15\frac{3}{4}') = 38\frac{2}{3}'$; then,
The total area of the walls $= (38\frac{2}{3} \times 10)$ sq. ft. $= 386\frac{2}{3}$ sq. ft.
The area of the ceiling $= (3\frac{7}{12} \times 15\frac{3}{4})$ sq. ft. $= 56\frac{7}{16}$ sq. ft.
The area of walls and ceiling $= 386\frac{2}{3}$ sq. ft. $+ 56\frac{7}{16}$ sq. ft. $= 443\frac{5}{48}$ sq. ft.;
$443\frac{5}{48}$ sq. ft. $= (443\frac{5}{48} \div 9)$ sq. yd. $= 49.2+$ sq. yd.

The deductions are: 3 doors = 3 × 1.2 sq. yd., or 3.6 sq. yd.; 1 window = .9 sq. yd.; and 1 skylight = (6 × 8) sq. ft., or 48 sq. ft. = (48 ÷ 9) sq. yd. = 5.3+ sq. yd.; 3.6 sq. yd. + .9 sq. yd. + 5.3 sq. yd. = 9.8 sq. yd.

The total area, less deductions = 49.2 sq. yd. – 9.8 sq. yd. = 39.4 sq. yd.;
39.4 × 32¢ = $12.608, or $12.61, the cost.

14. The distance round the room $= 2 \times (18' + 14') = 64'$; then,
The total area of the walls = (64 × 9) sq. ft. = 576 sq. ft.
The area of the ceiling = (18 × 14) sq. ft. = 252 sq. ft.
The area of walls and ceiling = 576 sq. ft. + 252 sq. ft. = 828 sq. ft.;

828 sq. ft. = (828 ÷ 9) sq. yd. = 92 sq. yd.; since 1 bundle of lath covers 5 sq. yd. [§ 321], the number of bundles = 92 ÷ 5, or 18.4 bundles.

Hence, 19 bundles of lath must be purchased.

15. The total area = (28 × 54) sq. ft. = 1512 sq. ft.

The deductions are: 14 windows = 14 × (4 × 7) sq. ft., or 392 sq. ft.; and 1 door = (5 × 9) sq. ft., or 45 sq. ft.; 392 sq. ft. + 45 sq. ft. = 437 sq. ft.

The area, less deductions = 1512 sq. ft. − 437 sq. ft. = 1075 sq. ft.;

1075 sq. ft. = (1075 ÷ 9) sq. yd. = $119\frac{4}{9}$ sq. yd.;

$119\frac{4}{9}$ × 20¢ = 23.88\frac{8}{9}$, or $23.89, the cost.

Page 227

1. The area of the roof = 2 × (22 × 81) sq. ft. = 3564 sq. ft.

The number of squares = 3564 ÷ 100, or 35.64 squares.

The number of shingles used = 35.64 × 1000, or 35,640 shingles.

Since there are 250 shingles to the bunch, the number of bunches used = 35,640 ÷ 250, or $142\frac{14}{25}$ bunches.

Hence, 143 bunches were required.

2. The number of shingles = 143 × 250, or 35,750 shingles.

At $2.20 per M, 35,750 shingles cost 35.750 × $2.20, or $78.65.

3. The area of the roof = 2 × (32 × 50) sq. ft. = 3200 sq. ft.

The number of squares = 3200 ÷ 100, or 32 squares.

Since 1000 shingles are estimated per square, the cost for shingles = 32 × $3.20, or $102.40; hence,

The total cost = $102.40 + $7.50 + $16 = $125.90.

4. From the solution of Ex. 3, the number of squares = 32;

32 × $4.75 = $152, the cost.

5. The width of the roof = 2 × 32′, or 64′ = 64 × 12″, or 768″.

Since there is a lap of 4″, the real width of each strip is 36″ − 4″, or 32″; then,

The number of strips required = 768 ÷ 32, or 24 strips.

6. As many rolls will be required as 3 is contained times in 24; that is, 24 ÷ 3, or 8 rolls; 8 rolls will cost 8 × 60¢, or $4.80.

7. From the solution of Ex. 3, the number of squares = 32; hence, the number of rolls = 32; 32 × $87\frac{1}{2}$¢ = $28, the cost for felt roofing.

8. Roofing nails cost 48 × 4¢, or $1.92; roofing caps cost 32 × $4\frac{1}{2}$¢, or $1.44; 50 gal. roofing cement cost 50 × 13¢, or $6.50; 18 gal. roofing cement cost 18 × 15¢, or $2.70; then,

The whole cost = $4.80 + $28 + $1.92 + $1.44 + $6.50 + $2.70 + $11.20 = $56.56.

9. The number of squares being 32 [solution of Ex. 3], the cost per square = $56.56 ÷ 32 = 1.76\frac{3}{4}$, or $1.77.

Page 229

1. The distance round the room $= 2 \times (9' + 12') = 42'$; each strip being $18''$, or $1\frac{1}{2}'$, wide, the total number of strips for the walls, disregarding openings $= 42 \div 1\frac{1}{2}$, or 28 strips; allowing for 2 windows, 2×2 strips $= 4$ strips, and for 2 doors, 2×3 strips $= 6$ strips, or 10 strips in all, we find the number of strips used $= 28 - 10$, or 18 strips; since each roll gives 3 strips, the number of rolls required $= 18 \div 3$, or 6 rolls; 6×50¢ $=$ \$3, the cost of the wall paper.

With ceiling paper put on the long way of the room, the number of strips used $= 9 \div 1\frac{1}{2}$, or 6 strips; since a roll is 8 yd., or 24 ft., long, the number of strips per roll $= 24 \div 12$, or 2 strips; then, the number of rolls required $= 6 \div 2$, or 3 rolls; 3×40¢ $=$ \$1.20, the cost of the ceiling paper.

Since it is 42 ft. around the room, the number of yards of border $= (42 \div 3)$ yd., or 14 yd.; 14×30¢ $=$ \$4.20, the cost of the border.

The total cost = \$3 + \$1.20 + \$4.20 = \$8.40.

2. The carpet is $\frac{27}{36}$, or $\frac{3}{4}$, yd. wide; since the room is 9 ft., or 3 yd., wide, as many strips are required to lay the carpet the long way of the room as $\frac{3}{4}$ is contained times in 3; that is, $3 \div \frac{3}{4}$, or 4 strips; since the room is 12 ft., or 4 yd., long, the number of yards of carpet required is 4×4, or 16 yd.; $16 \times$ \$1.40 = \$22.40, the cost.

3. Each strip was 10 ft., or $\frac{10}{3}$ yd., long.
The area of one strip $= (2 \times \frac{10}{3})$ sq. yd. $= 6\frac{2}{3}$ sq. yd.
The area of the other strip $= (1\frac{1}{2} \times \frac{10}{3})$ sq. yd. $= 5$ sq. yd.;
$6\frac{2}{3}$ sq. yd. $+ 5$ sq. yd. $= 11\frac{2}{3}$ sq. yd., the amount required;
$11\frac{2}{3} \times$ \$1.10 = \$12.83$\frac{1}{3}$, or \$12.84, the cost.

4. The distance round the room $= 2 \times (16' + 12') = 56'$; each strip being $18''$, or $1\frac{1}{2}'$, wide, the total number of strips for the walls, disregarding openings $= 56 \div 1\frac{1}{2}$, or $37\frac{1}{3}$, that is, 38 strips; allowing for 3 windows 3×2 strips $= 6$ strips, for 5 doors, 5×3 strips $= 15$ strips, and for the fireplace 3 strips, or 24 strips in all, we find the number of strips used $= 38 - 24$, or 14 strips; since 3 strips are cut from a roll, the number of rolls required $= 14 \div 3$, or $4\frac{2}{3}$ rolls; that is, 5 rolls must be bought; 5×50¢ $=$ \$2.50, the cost of the wall paper.

With ceiling paper put on the short way of the room, the number of strips used $= 16 \div 1\frac{1}{2}$, or $10\frac{2}{3}$ strips; that is, 11 strips were necessary; since a roll is 8 yd., or 24 ft., long, the number of strips per roll $= 24 \div 12$, or 2 strips; then the number of rolls required $= 11 \div 2$, or $5\frac{1}{2}$ rolls; the cost of 6 rolls $= 6 \times 40$¢, or \$2.40.

Since it is 56 ft. around the room, the number of yards of border $= (56 \div 3)$ yd., or $18\frac{2}{3}$ yd.; $18\frac{2}{3} \times 30$¢ $=$ \$5.60, the cost of the border.

The total cost = \$2.50 + \$2.40 + \$5.60 = \$10.50.

Page 230

1. The distance round the room $= 2 \times (9' + 12') = 42'$; then,
The total area of the walls $= (42 \times 9\frac{1}{4})$ sq. ft. $= 388\frac{1}{2}$ sq. ft.
The area of the ceiling $= (9 \times 12)$ sq. ft. $= 108$ sq. ft.
The area of walls and ceiling $= 388\frac{1}{2}$ sq. ft. $+ 108$ sq. ft. $= 496\frac{1}{2}$ sq. ft.;
$496\frac{1}{2}$ sq. ft. $= (496\frac{1}{2} \div 9)$ sq. yd. $= 55\frac{1}{6}$ sq. yd.
The deductions are: for 2 windows, 2 sq. yd.; and for 2 doors, 2×2 sq. yd., or 4 sq. yd.; 2 sq. yd. $+$ 4 sq. yd. $= 6$ sq. yd.
The total area, less deductions $= 55\frac{1}{6}$ sq. yd. $- 6$ sq. yd., or $49\frac{1}{6}$ sq. yd.;
$49\frac{1}{6} \times 30$¢ $=$ \$14.75, the cost for the bedroom.

2. The distance round the room $= 4 \times 10'$, or $40'$; then,
The total area of the walls $= (40 \times 9\frac{1}{4})$ sq. ft. $= 370$ sq. ft.
The area of the ceiling $= (10 \times 10)$ sq. ft. $= 100$ sq. ft.
The area of walls and ceiling $= 370$ sq. ft. $+ 100$ sq. ft. $= 470$ sq. ft.;
470 sq. ft. $= (470 \div 9)$ sq. yd. $= 52\frac{2}{9}$ sq. yd.
The deductions are: for 1 window, 1 sq. yd., and for 3 doors, 3×2 sq. yd., or 6 sq. yd.; in all, 7 sq. yd.
The total area, less deductions $= 52\frac{2}{9}$ sq. yd. $- 7$ sq. yd. $= 45\frac{2}{9}$ sq. yd.;
$45\frac{2}{9} \times 30$¢ $=$ \$13.56$\frac{2}{3}$, or \$13.57, the cost for the kitchen.

3. The distance round the room $= 2 \times (16' + 12') = 56'$; then,
The total area of the walls $= (56 \times 9\frac{1}{4})$ sq. ft. $= 518$ sq. ft.
The area of the ceiling $= (16 \times 12)$ sq. ft. $= 192$ sq. ft.
The area of walls and ceiling $= 518$ sq. ft. $+ 192$ sq. ft. $= 710$ sq. ft.;
710 sq. ft. $= (710 \div 9)$ sq. yd. $= 78\frac{8}{9}$ sq. yd.
The deductions are: for 3 windows, 3 sq. yd., and for 5 doors, 5×2 sq. yd., or 10 sq. yd.; in all, 13 sq. yd.
The total area, less deductions $= 78\frac{8}{9}$ sq. yd. $- 13$ sq. yd. $= 65\frac{8}{9}$ sq. yd.;
$65\frac{8}{9} \times 30$¢ $=$ \$19.76$\frac{2}{3}$, or \$19.77, the cost for the living room.

4. The area of the part $14'$ by $18' = (14 \times 18)$ sq. ft. $= 252$ sq. ft.
The area of the part $14'$ by $27' = (14 \times 27)$ sq. ft. $= 378$ sq. ft.
The total area of the floor $= 252$ sq. ft. $+ 378$ sq. ft. $= 630$ sq. ft.
The volume of concrete 4 in., or $\frac{1}{3}$ ft., deep $= (630 \times \frac{1}{3})$ cu. ft. $= 210$ cu. ft.;
210 cu. ft. $= (210 \div 27)$ cu. yd. $= 7\frac{7}{9}$ cu. yd.;
$7\frac{7}{9} \times$ \$4.25 $=$ \$33.05$\frac{5}{9}$, or \$33.06, the cost.

5. From the solution of Ex. 4 the area of the cellar floor $= 630$ sq. ft.; then,
The cubic contents $= (630 \times 6)$ cu. ft. $= 3780$ cu. ft.;
3780 cu. ft. $= (3780 \div 27)$ cu. yd. $= 140$ cu. yd.;
140×45¢ $=$ \$63, the cost of excavation.

6. $25 \times$ \$8.50 $=$ \$212.50, the cost.

7. 784 × $8.75 = $6860, the value of the red slate;
1515 × $7 = $10,605, the value of the green slate;
$6860 + $10,605 = $17,465, the total value of the output.

8. The length of walks constructed = 32,772 ft. + 14,265 ft. = 47,037 ft.;
47,037 ft. = (47,037 ÷ 3) yd. = 15,679 yd.
The total cost = $26,575 + $10,000 = $36,575;
$36,575 ÷ 15,679 = $2.332 −, or $2.33, the average cost per lineal yard.

9. 32,772 ft. = (32,772 ÷ 3) yd. = 10,924 yd.;
$26,575 ÷ 10,924 = $2.433−, or $2.43, the cost per yard at public expense;
14,265 ft. = (14,265 ÷ 3) yd. = 4755 yd.;
$10,000 ÷ 4755 = $2.103+, or $2.10, the cost per yard at private expense.
Then, it cost $2.43 − $2.10, or $.33, more per yard at public expense.

Page 231

10. The area of the floor = (120 × 48) sq. ft. = 5760 sq. ft.; then,
The total weight it could support = 5760 × 150 lb. = 864,000 lb. = (864,000 ÷ 2000) T. = 432 T.

11. Since the area, 24,317,910 sq. yd., was obtained by multiplying the number of yards in length by $\frac{3}{4}$, the number of yards in width, then the number of yards in length = 24,317,910 ÷ $\frac{3}{4}$, or 32,423,880 yd.

12. The total area of the roof = 2 × (30 × 20) sq. ft. = 1200 sq. ft.; then,
The total weight of the slate = 1200 × $6\frac{3}{4}$ lb., or 8100 lb.

13. The width of the lawn less the width of the path = 30 ft. − 3 ft., or 27 ft.; then, every foot of this width took 45 ÷ 9, or 5, strips of sod; and the total number of strips required = 27 × 5, or 135, strips.

14. 8000 ÷ $1333\frac{1}{3}$ = 6; that is, 8000 is 6 times $1333\frac{1}{3}$; since $1333\frac{1}{3}$ ft. of lumber make 4000 strips, 8000 ft. make 6 × 4000 strips, or 24,000 strips.

15. The area of the fence = ($6\frac{1}{4}$ × 78) sq. ft. = $487\frac{1}{2}$ sq. ft.; $487\frac{1}{2}$ ÷ 650 = $\frac{3}{4}$; that is, $487\frac{1}{2}$ is $\frac{3}{4}$ of 650; since 1 gal. of paint covers 650 sq. ft., the quantity required to cover $487\frac{1}{2}$ sq. ft. = $\frac{3}{4}$ gal.

16. The cubic contents of the bin = (12 × 9 × $5\frac{1}{3}$) cu. ft. = 576 cu. ft.; hence, the bin contains as many tons of coal as 36 cu. ft. is contained times in 576 cu. ft.; that is, 576 ÷ 36, or 16 T.

17. The space to be occupied = (24 × 20 × 18) cu. ft. = 8640 cu. ft.; hence, as many tons of ice can be packed into a space of 8640 cu. ft. as 40 is contained times in 8640; that is, 8640 ÷ 40, or 216 T.

18. 15 × $1\frac{2}{3}$ cu. yd. = 25 cu. yd.; the cost per cubic yard = $21.50 ÷ 25 = $.86.

19. 800 ft. ÷ 50 ft. = 16; 16 × 1¢ = 16¢, the additional cost per cubic yard;
27¢ + 16¢ = 43¢, the total cost per cubic yard;
85 × 43¢ = $36.55, the total cost.

Page 232

20. 15 in. = $1\frac{1}{4}$ ft.; the volume of the wall = (6 × 36 × $1\frac{1}{4}$) cu. ft., or 270 cu. ft. = (270 ÷ 27) cu. yd., or 10 cu. yd.; then, the wall contains 10 × 600 bricks, or 6000 bricks.

21. 18 in. = $1\frac{1}{2}$ ft.; the volume of the wall = (39 × 5 × $1\frac{1}{2}$) cu. ft., or $292\frac{1}{2}$ cu. ft. = ($292\frac{1}{2}$ ÷ 27) cu. yd., or $10\frac{5}{6}$ cu. yd.; $10\frac{5}{6}$ × $7.50 = $81.25, the cost.

22. Since the wall contained $292\frac{1}{2}$ cu. ft. [solution to Ex. 21], the weight per cubic foot = 38,025 lb. ÷ $292\frac{1}{2}$, or 130 lb.

23. The volume excavated = (135 × 102 × 6) cu. ft. = 82,620 cu. ft. = (82,620 ÷ 27) cu. yd., or 3060 cu. yd.; 3060 × $19\frac{1}{2}$¢ = $596.70, the cost.

24. Since, from the solution of Ex. 23, there were 3060 cu. yd. of material, the average car load = 3060 cu. yd. ÷ 40, or $76\frac{1}{2}$ cu. yd.

25. $2\frac{1}{2}$ hr. = $2\frac{1}{2}$ × 60 min., or 150 min. = 150 × 60 sec., or 9000 sec.; 9000 ÷ 40 = 225; that is, 9000 is 225 times 40; since the dredge loaded 6 cu. yd. of mud every 40 sec., in 9000 sec. it loaded 225 × 6 cu. yd., or 1350 cu. yd.

26. $\frac{3}{4}$ mi. = $\frac{3}{4}$ of 5280 ft., or 3960 ft.; then, the cubic contents of the trench = (10 × 18 × 3960) cu. ft., or 712,800 cu. ft. = (712,800 ÷ 27) cu. yd., or 26,400 cu. yd.; since the shovel removes 1200 cu. yd. of earth per day, it should take as many days to remove 26,400 cu. yd. as 1200 is contained times in 26,400; that is, 26,400 ÷ 1200, or 22 days.

27. The area of the courtyard = (75 × 50) sq. ft. = 3750 sq. ft.;
3750 sq. ft. = (3750 ÷ 9) sq. yd. = $416\frac{2}{3}$ sq. yd.;
$416\frac{2}{3}$ × $32.70 = $13,625, the cost.

28. From the solution of Ex. 3, the area = 3750 sq. ft.;
3750 × $15\frac{1}{4}$ lb. = $57{,}187\frac{1}{2}$ lb., the total weight.

29. $\frac{5}{8}$ mi. = $\frac{5}{8}$ of 5280 ft. = 3300 ft.; then, the area paved = (3300 × 45) sq. ft., or 148,500 sq. ft. = (148,500 ÷ 9) sq. yd., or 16,500 sq. yd.;
16,500 × $1.96 = $32,340, the cost.

30. $4\frac{1}{2}$ mi. = $4\frac{1}{2}$ × 5280 ft. = 23,760 ft.; then, the total area = (23,760 × 14) sq. ft., or 332,640 sq. ft. = (332,640 ÷ 9) sq. yd., or 36,960 sq. yd.;
36,960 × 50¢ = $18,480, the cost.

31. The area to be sprinkled = (36 × 5100) sq. ft., or 183,600 sq. ft. = (183,600 ÷ 9) sq. yd.; or 20,400 sq. yd.; 20,400 ÷ 850 = 24; that is, 20,400 is 24 times 850; since 850 sq. yd. of pavement require 60 cu. ft. of water, 20,400 sq. yd. take 24 × 60 cu. ft., or 1440 cu. ft.

Since 1 cu. ft. = $7\frac{1}{2}$ gal., 1440 cu. ft. = 1440 × $7\frac{1}{2}$ gal., or 10,800 gal.

Page 237

13. 99 ÷ 297 = 33⅓; that is, 99 is .33⅓, or 33⅓%, of 297.

14. .66 ÷ 8.25 = .08; that is, .66 is .08, or 8%, of 8.25.

15. 3.4 ÷ 544 = .00625; that is, 3.4 is .00625, or ⅝%, of 544.

16. 216 ÷ 1728 = .125; that is, 216 is .125, or 12½%, of 1728.

17. 784 ÷ 2240 = .35; that is, 784 is .35, or 35%, of 2240.

18. 692 ÷ 4152 = .16⅔; that is, 692 is .16⅔, or 16⅔%, of 4152.

19. $1.68 ÷ $35 = .048; that is, $1.68 is .048, or 4.8%, of $35.

20. $7.92 ÷ $48 = .165; that is, $7.92 is .165, or 16.5%, of $48.

21. $8.40 ÷ $75 = .112; that is, $8.40 is .112, or 11.2%, of $75.

22. Since $306.72 is 3.6%, or .036, of the number, the number = $306.72 ÷ .036, or $8520.

23. Since $465.60 is 75%, or ¾, of the number, ¼ of the number = ⅓ of $465.60 or $155.20, and the number = 4 × $155.20, or $620.80.

24. Since $507.15 is 23%, or .23, of the number, the number = $507.15 ÷ .23, or $2205.

25. Since $812.16 is 4.7%, or .047, of the number, the number = $812.16 ÷ .047, or $17,280.

26. Since $2698.29, is 87½%, or ⅞, of the number, ⅛ of the number = ⅐ of $2698.29, or $385.47, and the number = 8 × $385.47, or $3083.76.

27. Since $4295.25 is 24.9%, or .249, of the number, the number = $4295.25 ÷ .249, or $17,250.

28. Since $6384.90 is 83⅓%, or ⅚, of the number, ⅙ of the number = ⅕ of $6384.90, or $1276.98, and the number = 6 × $1276.98, or $7661.88.

29. Since $7844.62 is 28.63%, or .2863, of the number, the number = $7844.62 ÷ .2863, or $27,400.

30. 27 ÷ 79 = .3418 −; that is, 27 is .3418, or 34.18%, of 79.

31. 69 ÷ 42 = 1.6429 −; that is, 69 is 1.6429, or 164.29%, of 42.

32. 45 ÷ 264 = .1705 −; that is, 45 is .1705, or 17.05%, of 264.

33. 24 ÷ 8.76 = 2.7397 +; that is, 24 is 2.7397, or 273.97%, of 8.76.

34. 28.6 ÷ 46.49 = .6152 −; that is, 28.6 is .6152, or 61.52%, of 46.49.

35. 397 ÷ 629.4 = .6308 −; that is, 397 is .6308, or 63.08%, of 629.4.

36. A long ton contains 73.19%, or .7319, of 2240 lb. = 1639.456 lb.

37. Since 5931 lb. is 65.9%, or .659, of the total weight, the coal weighs 5931 lb. ÷ .659 = 9000 lb.

38. 106 ÷ 153 = $.693^-$; that is, 106 is .693, or 69.3%, of 153.
Hence, the team won 69.3% of the games played.

39. 171 ÷ 490 = $.349^-$; that is, 171 is .349, or 34.9%, of 490.
Hence, 34.9% was his batting average.

40. 899 − 15 = 884, the number of successful attempts;
884 ÷ 899 = $.983^+$; that is, 884 is .983, or 98.3%, of 899.
Hence, his fielding average was 98.3%.

41. 3⅖%, or .034, of 6000 = 204, the number of horse vehicles;
7½%, or .07½, of 6000 = 450, the number of street cars;
9.9%, or .099, of 6000 = 594, the number of motor cars;
79⅕%, or .792, of 6000 = 4752, the number of bicycles.

Page 238

42. 274,447 ÷ 994,762 = $.276^-$; that is, 274,447 is .276, or 27.6%, of 994,762.

Hence, 27.6% of the pensioners were widows.

43. Since 6434.90 was 22.9%, or .229, of the cost, the cost = \$6434.90 ÷ .229, or \$28,100.

44. 50,000 ÷ 270,000 = $.185^+$; that is, 50,000 is .185, or 18.5%, of 270,000.
Hence, 18.5% could read.

45. 225 × 196 lb. = 44,100 lb., the weight of the flour.

Since 44,100 lb. is 75%, or ¾, of the weight of the wheat used, ¼ is ⅓ of 44,100 lb., or 14,700 lb., and the entire weight = 4 × 14,700 lb., or 58,800 lb.; then,

58,800 lb. ÷ 60 lb. = 980, the number of bushels needed.

46. 151.2 ÷ 432 = .35; that is, 151.2 is .35, or 35%, of 432.
Hence, 35% was sand.
146.88 ÷ 432 = .34; that is, 146.88 is .34, or 34%, of 432.
Hence, 34% was limestone,
43.2 ÷ 432 = .10; that is, 43.2 is .10, or 10%, of 432.
Hence, 10% was soda.
36.72 ÷ 432 = .085; that is, 36.72 is .085, or 8½%, of 432.
Hence, 8½% was broken glass.
54 ÷ 432 = .125; that is, 54 is .125, or 12½%, of 432.
Hence, 12½% was other substances.

47. Since 25%, or ¼, of the value of his stock was \$2125, his stock was worth 4 × \$2125, or \$8500;

\$1275 ÷ \$8500 = .15; that is, \$1275 is .15, or 15%, of \$8500.
Hence, he lost 15% of the value.

48. 45.05%, or .4505, of $4,904,204 = $2,209,343.9020.
Hence, the value from Great Britain was $2,209,343.90+.
6.52%, or .0652, of $4,904,204 = $319,754.1008.
Hence, the value from the United States was $319,754.10+.
15.48%, or .1548, of $4,904,204 = $759,170.7792.
Hence, the value from Spain was $759,170.78−.

49. 14,600 ÷ 33,640 = .434+ ; that is, 14,600 is .434, or 43.4%, of 33,640.
Hence, the U.S. produced 43.4% of the otter skins.
8000 ÷ 66,000 = .121+ ; that is, 8000 is .121, or 12.1%, of 66,000.
Hence, the U.S. produced 12.1% of the beaver skins.
24,000 ÷ 95,485 = .251+ ; that is, 24,000 is .251, or 25.1%, of 95,485.
Hence, the U.S. produced 25.1% of the seal skins.
578,000 ÷ 728,000 = .794−; that is, 578,000 is .794, or 79.4%, of 728,000;
Hence, the U.S. produced 79.4% of the mink skins.
4,035,000 ÷ 5,285,000 = .763−; that is, 4,035,000 is .763, or 76.3%, of 5,285,000.

Page 240

1. 100% + $16\frac{2}{3}$%, or $116\frac{2}{3}$%, of $6540 = $7630.
Hence, his capital was then $7630.

2. 100% − $12\frac{1}{2}$%, or $87\frac{1}{2}$%, of $4868 = $4259.50.
Hence, his income last year was $4259.50.

3. The price was advanced $5.82 − $4.85, or $.97 ;
$.97 ÷ $4.85 = .20 ; that is, $.97 is 20% of $4.85.
Hence, the price was advanced 20%.

4. 100% + $14\frac{2}{7}$%, or $114\frac{2}{7}$%, of $1.75 = $2.00.
Hence, he then received $2 per day.

5. 37 − 34 = 3, the increase ;
3 ÷ 34 = .088+ ; that is, 3 is 8.8% of 34.
Hence, 8.8% was the increase.

6. 100% + 45.09%, or 145.09%, of $3,179,498 = $4,613,133.6482.
Hence, the income for the third year was $4,613,133.65−.

7. The increase of males was 4503 − 2741, or 1762 ;
1762 ÷ 2741 = .643− ; that is, 1762 is .643, or 64.3%, of 2741.
Hence, the number of males increased 64.3%.
The increase of females was 7768 − 3675, or 4093 ;
4093 ÷ 3675 = 1.114+ ; that is, 4093 is 1.114 times, or 111.4%, of 36.75.
Hence, the number of females increased 111.4%.

8. The increase in weight was 9282 lb. – 8840 lb., or 442 lb.;
442 ÷ 8840 = .05; that is, 442 is .05, or 5 %, of 8840.
Hence, the increase in the yield was 5 %.
$2210 ÷ 8840 = $.25, the price per pound one year;
$1949.22 ÷ 9282 = $.21, the price per pound the next year.
The decrease in price = $.25 – $.21, or $.04;
$.04 ÷ $.25 = .16; that is, $.04 is .16, or 16 %, of $.25.
Hence, there was a 16 % decrease in price.

9. From 1860 to 1870 the population increased 42,491 – 6857, or 35,634;
35,634 ÷ 6857 = 5.197–; that is, 35,634 is 5.197 times, or 519.7 %, of 6857.
Hence, from 1860 to 1870 the population increased 519.7 %.
From 1870 to 1880 the population increased 62,266 – 42,491, or 19,775;
19,775 ÷ 42,491 = .465+; that is, 19,775 is .465, or 46.5 %, of 42,491.
Hence, from 1870 to 1880 the population increased 46.5 %.

10. From 1880 to 1890 the population decreased 62,266 – 45,761, or 16,505;
16,505 ÷ 62,266 = .265+; that is, 16,505 is .265, or 26.5 %, of 62,266.
Hence, from 1880 to 1890 the population decreased 26.5 %.
From 1890 to 1900 the population decreased 45,761 – 42,335, or 3426.
3426 ÷ 45,761 = .075–; that is, 3426 is .075, or 7.5 %, of 45,761.
Hence, from 1890 to 1900 the population decreased 7.5 %.

11. From 1870 to 1900 the population decreased 42,491 – 42,335, or 156;
156 ÷ 42,491 = .0037–; that is, 156 is .0037, or .37 %, of 42,491.
Hence, from 1870 to 1900 the population decreased .37 %.

Page 241

3. The sum of money plus 43 % of it = 143 % of it = $354.64.
Hence, the sum of money = $354.64 ÷ 1.43 = $248.

4. The sum of money plus 68 % of it = 168 % of it = $890.40.
Hence, the sum of money = $890.40 ÷ 1.68 = $530.

5. The sum of money plus 16⅔ % of it = 116⅔ %, or 7/6, of it = $693.84.
Hence, the sum of money = $693.84 ÷ 7/6 = $594.72.

6. The sum of money plus 62½ % of it = 162½ %, or 13/8, of it = $459.16.
Hence, the sum of money = $459.16 ÷ 13/8 = $282.56.

Page 242

7. His former salary plus 18 % of it = 118 % of it = $1652.
Hence, his salary before the increase = $1652 ÷ 1.18 = $1400.

8. Her rate six months ago plus 25 % of it = 125 %, or 5/4, of it = 50 words.
Hence, her rate six months ago = 50 words ÷ 5/4 = 40 words.

9. The number last year plus 8 % of it = 108 % of it = 486; Hence, the number of children last year = 486 ÷ 1.08, or 450 children.

10. The cost of horse and carriage plus 60 % of it = 160 %, or $\frac{8}{5}$, of it = \$ 1250; Hence, the cost of horse and carriage = \$ 1250 ÷ $\frac{8}{5}$ = \$ 781.25.

11. The cost for the year before plus 4 % of it = 104 % of it = \$ 442; Hence, the cost for the year before = \$ 442 ÷ 1.04 = \$ 425.

12. The circulation three years ago plus 26 % of it = 126 % of it = 177,030; Hence, the circulation then = 177,030 ÷ 1.26 = 140,500.

13. The mileage at the close of the war plus 500 % of it = 600 % of it = 210,000 mi.; hence, the mileage then = 210,000 mi. ÷ 6.00 = 35,000 mi.

14. The production at the beginning plus 323 % of it = 423 % of it = 274,950 yd.; hence, the production then = 274,950 yd. ÷ 4.23 = 65,000 yd.

15. The actual amount plus 2.5 % of it = 102.5 % of it = 65,600 cu. ft.; Hence, the actual amount = 65,600 cu. ft. ÷ 1.025 = 64,000 cu. ft.

16. The value at the beginning plus 84.8 % of it = 184.8 % of it = \$ 33,859,980; Hence, the value at first = \$ 33,859,980 ÷ 1.848 = \$ 18,322,500.

Page 244

3. The number less 32 % of it = 68 % of it = \$ 166.60; Hence, the number = \$ 166.60 ÷ .68 = \$ 245.

4. The number less 65 % of it = 35 % of it = \$ 332.50; Hence, the number = \$ 332.50 ÷ .35 = \$ 950.

5. The number less $37\frac{1}{2}$ % of it = $62\frac{1}{2}$ %, or $\frac{5}{8}$, of it = \$453.75; Hence, the number = \$453.75 ÷ $\frac{5}{8}$ = \$726.

6. The number less $83\frac{1}{3}$ % of it = $16\frac{2}{3}$ %, or $\frac{1}{6}$, of it = \$742.36; Hence, the number = 6 × \$742.36 = \$4454.16.

7. His weight at the beginning less 5 % of it = 95 % of it = 114 lb.; Hence, his weight at the beginning = 114 lb. ÷ .95 = 120 lb.

8. The weight before cooking less 20 % of it = 80 %, or $\frac{4}{5}$, of it = 14 lb.; Hence, the weight before cooking = 14 lb. ÷ $\frac{4}{5}$ = $17\frac{1}{2}$ lb.

9. All his money less 76 % of it = 24 % of it = \$7680; Hence, he had \$7680 ÷ .24, or \$32,000.

10. His debts less 60 % of them = 40 %, or $\frac{2}{5}$, of them = \$ 15,600; Hence, he owed \$ 15,600 ÷ $\frac{2}{5}$, or \$ 39,000.

11. Its original length less $5\frac{1}{2}$ % of it = $94\frac{1}{2}$ % of it = 37.8 yd.; Hence, its original length = 37.8 yd. ÷ .$94\frac{1}{2}$ = 40 yd.

12. The price before less $8\frac{1}{3}$ % of it = $91\frac{2}{3}$ % of it = \$5.50; Hence, the price the winter before = \$5.50 ÷ .$91\frac{2}{3}$ = \$6.00.

13. The number engaged less $6\frac{1}{2}\%$ of it $= 93\frac{1}{2}\%$ of it $= 39,270$;
Hence, the number engaged $= 39,270 \div .93\frac{1}{2} = 42,000$.

14. The amount shipped less 25% of it $= 75\%$, or $\frac{3}{4}$, of it $= 600$ bbl.;
Hence, the amount shipped $= 600$ bbl. $\div \frac{3}{4} = 800$ bbl.

15. The amount he received less $37\frac{1}{2}\%$ of it $= 62\frac{1}{2}\%$, or $\frac{5}{8}$, of it $= \$4.50$;
Hence, he received $\$4.50 \div \frac{5}{8}$, or $\$7.20$;
$\$7.20 \div 72 = \$.10$, the price per cake.

16. The population less 19.8% of it $= 80.2\%$ of it $= 952,375$;
Hence, the population $= 952,375 \div .802 = 1,187,500$.

17. The cost of all the hats less 75% of it $= 25\%$, or $\frac{1}{4}$, of it $= \$360$;
Hence, the cost of all the hats $= 4 \times \$360 = \$1440$;
Then, the number of hats $= \$1440 \div \$2.50$, or 576 hats.

18. The population at the end of the first year less 16% of it $= 84\%$ of it $= 8820$; hence, the population then $= 8820 \div .84 = 10,500$. The population at the beginning of the first year less 16% of it $= 84\%$ of it $= 10,500$; hence, the population before the decrease $= 10,500 \div .84 = 12,500$.

Page 247

1. The gain $= 15\%$ of $\$36 = \$5.40$.

2. The loss $= 34\%$ of $\$25 = \$8.50$.

3. $16\frac{2}{3}\%$, or $\frac{1}{6}$, of $\$3.84 = \$.64$, the profit;
$\$3.84 + \$.64 = \$4.48$, the selling price.

4. The loss per bushel $= 66¢ - 41\frac{1}{4}¢ = 24\frac{3}{4}¢$;
$24\frac{3}{4}¢ \div 66¢ = .375$; that is, $24\frac{3}{4}¢$ is $.375$, or $37\frac{1}{2}\%$, of $66¢$;
Hence, the loss was $37\frac{1}{2}\%$.

5. $\$14.40 \div 60 = \$.24$, the price he paid;
$8\frac{1}{3}\%$ of $\$.24 = \$.02$, the gain per pound;
$\$.24 + \$.02 = \$.26$, the selling price.

6. $12\frac{1}{2}\%$ of $\$1648 = \$206$, the gain;
Hence, the leather was sold for $\$1648 + \$206$, or $\$1854$.

7. He paid for each $\$1.08 \div 12$, or $\$.09$;
He gained on each $15¢ - 9¢$, or $6¢$;
$6¢$ is $\frac{6}{9}$, or $\frac{2}{3}$, of $9¢$; hence, his gain was $\frac{2}{3}$, or $66\frac{2}{3}\%$, of the cost.

8. $\$1.50 =$ the cost $+ 20\%$ of the cost $= 120\%$, or $\frac{6}{5}$, of the cost;
The cost $= \$1.50 \div \frac{6}{5} = \$1.25$;
$12 \times \$1.25 = \$15$, the cost per dozen.

9. $\$34.56 \div 144 = \$.24$, the cost of each;
$28¢ - 24¢ = 4¢$, the gain on each;
$4¢$ is $\frac{4}{24}$, or $\frac{1}{6}$, of $24¢$; hence, the gain was $\frac{1}{6}$, or $16\frac{2}{3}\%$, of the cost

10. $12 \times 25\text{¢} = \$3$, the retail price per dozen;
$\$3 =$ the cost per dozen $+\ 60\%$ of it $= 160\%$, or $\frac{8}{5}$, of it;
Hence, the cost per dozen $= \$3 \div \frac{8}{5} = \$1.87\frac{1}{2}$.

11. The loss $= 14\%$ of $\$8250 = \$1155$;
$\$8250 - \$1155 = \$7095$, the selling price.

12. The total cost plus 8% of it $= 108\%$ of it $= \$103.68$;
Hence, the total cost $= \$103.68 \div 1.08 = \$96$;
The cost per thousand feet $= \$96 \div 4.800 = \$20$.

13. The gain per box $= 20\%$ of $\$1.35 = \$.27$;
The number of boxes $= 117 \times 362$, or 42,354 boxes; then,
$42{,}354 \times \$.27 = \$11{,}435.58$, the total gain.

14. The cost per quart $= 60\text{¢} \div 32 = 1\frac{7}{8}\text{¢}$;
The gain per quart $= 33\frac{1}{3}\%$ of $1\frac{7}{8}\text{¢} = \frac{5}{8}\text{¢}$;
Hence, the selling price per quart $= 1\frac{7}{8}\text{¢} + \frac{5}{8}\text{¢} = 2\frac{1}{2}\text{¢}$.

Page 248

15. The number of 5-lb. boxes in 1 cwt. $= 100 \div 5$, or 20 boxes;
The cost per box $= \$3.50 \div 20 = \$.17\frac{1}{2}$;
$21\text{¢} - 17\frac{1}{2}\text{¢} = 3\frac{1}{2}\text{¢}$, the gain per box;
$3\frac{1}{2}\text{¢} \div 17\frac{1}{2}\text{¢} = \frac{1}{5}$; that is, $3\frac{1}{2}\text{¢}$ is $\frac{1}{5}$, or 20%, of $17\frac{1}{2}\text{¢}$;
Hence, the gain was 20%.

16. The cost per pound $= \$4.50 \div 100 = \$.04\frac{1}{2}$;
The profit per pound $= 11\frac{1}{9}\%$, of $4\frac{1}{2}\text{¢} = \frac{1}{2}\text{¢}$;
$4\frac{1}{2}\text{¢} + \frac{1}{2}\text{¢} = 5\text{¢}$, the selling price per pound.

17. The cost per pound $= \$22.50 \div 200 = \$.11\frac{1}{4}$;
The gain per pound $= 13\frac{1}{2}\text{¢} - 11\frac{1}{4}\text{¢} = 2\frac{1}{4}\text{¢}$;
$2\frac{1}{4}\text{¢} \div 11\frac{1}{4}\text{¢} = \frac{1}{5}$; that is, $2\frac{1}{4}\text{¢}$ is $\frac{1}{5}$, or 20%, of $11\frac{1}{4}\text{¢}$;
Hence, 20% is gained.

18. $\$1.32 \div 12 = \$.11$, the cost of each;
$25\text{¢} - 11\text{¢} = 14\text{¢}$, the gain on each;
$14\text{¢} \div 11\text{¢} = 1.273^-$; that is, 14¢ is 1.273 times, or 127.3%, of 11¢;
Hence, the gain was 127.3%.

19. Its value less $12\frac{1}{2}\%$ of it $= 87\frac{1}{2}\%$, or $\frac{7}{8}$, of it $= \$35$;
Hence, its value $= \$35 \div \frac{7}{8} = \$40$;
The value plus $12\frac{1}{2}\%$ of it $= 112\frac{1}{2}\%$, or $\frac{9}{8}$, of it $=$ the selling price;
$\frac{9}{8}$ of $\$40 = \$45$, the selling price; then,
The gain $= \$45 - \$35 = \$10$.

20. The selling price per crate = 30 × 12¢ = $3.60 ;
$3.60 − $2.25 = $1.35, the gain per crate ;
$1.35 ÷ $2.25 = .60 ; that is, $1.35 is .60, or 60%, of $2.25 ;
Hence, the gain is 60%.

21. The cost per pair = $18.48 ÷ 12 = $1.54 ;
The gain per pair = $2 − $1.54 = $.46 ;
$.46 ÷ $1.54 = .299^{-} ; that is, $.46 is .299, or 29.9%, of $1.54 ;
Hence, the gain was 29.9%.

22. The first house sold for 120%, or $\frac{6}{5}$, of $2400 = $2880 ;
The gain on it = $2880 − $2400 = $480 ;
The loss on the second house = 4% of $5200 = $208 ;
$480 − $208 = $272, the net gain.

23. The cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = $6 ;
Hence, the cost = $6 ÷ $\frac{6}{5}$ = $5 ;
The gain after the advance = $6.50 − $5 = $1.50 ;
$1.50 ÷ $5 = .30 ; that is, $1.50 is .30, or 30%, of $5 ;
Hence, the gain was 30%.

24. He should have gained 15% of $50,000 = $7500 ;
He should have received $50,000 + $7500 = $57,500 ;
He lost in bad debts 2$\frac{1}{4}$% of $57,500 = $1293.75 ;
Hence, his real gain = $7500 − $1293.75 = $6206.25.

25. He neither gained nor lost on the oranges ;
He sold the bananas for 130% of $280 = $364 ; then,
His gain on the bananas = $364 − $280 = $84 ;
His loss on the peaches = 5% of $320 = $16 ;
Then, he gained on all $84 − $16 = $68.

Page 250

2. 150 × 36¢ = $54, the amount of the sale ; then,
5% of $54 = $2.70, the commission ;
$54 − $2.70 = $51.30, the net proceeds.

3. 3% of $4620 = $138.60 ;
The total deductions = $138.60 + $85 = $223.60 ;
$4620 − $223.60 = $4396.40, the net proceeds.

4. 7% of $745 = $52.15, the commission ;
$745 − $52.15 = $692.85.

5. 3$\frac{1}{2}$% of $2840.50 = $99.4175, or $99.42, the commission.

Page 251

6. 2% of $97,546.50 = $1950.93, the commission.

7. The number of pounds = 250 × 132, or 33,000 lb.;
33,000 × 14½¢ = $4785, the amount of the sale;
2% of $4785 = $95.70, the commission;
$4785 – $95.70 = $4689.30, the net proceeds.

8. 4% of $250 = $10, his commission; then,
His weekly income = $8 + $10 = $18.

9. The amount of the sale = 4 × $35 = $140;
40% of $140 = $56, the commission;
The expense of delivering = 4 × $2.25 = $9;
The total deductions = $56 + $9 = $65;
$140 – $65 = $75, the net proceeds.

10. The number of pounds = 225 × 500 = 112,500 lb.;
The amount of the sale = 112,500 × 11¢ = $12,375;
3% of $12,375 = $371.25, the commission;
The total deductions = $371.25 + $125 = $496.25;
$12,375 – $496.25 = $11,878.75, the net proceeds.

11. The amount of the sale = 500 × 75¢ = $375;
5% of $375 = $18.75, the commission;
$375 – $18.75 = $356.25, the net proceeds.

12. The amount of the sale = 250 × 85¢ = $212.50;
6% of $212.50 = $12.75, the commission;
$212.50 – $12.75 = $199.75, the net proceeds.

13. The amount of the sale = 360 × $1.75 = $630;
10% of $630 = $63, the commission;
$630 – $63 = $567, the net proceeds.

14. The amount of the sale = 120 × $1.25 = $150;
8% of $150 = $12, the commission;
$150 – $12 = $138, the net proceeds.

15. The amount of the sale = 960 × 12¢ = $115.20;
7½% of $115.20 = $8.64, the commission;
$115.20 – $8.64 = $106.56, the net proceeds.

16. The amount of the sale = 2880 × 18¾¢ = $540;
5% of $540 = $27, the commission;
$540 – $27 = $513, the net proceeds.

17. The amount of the sale = 1280 × 8¼¢ = $105.60;
5% of $105.60 = $5.28, the commission;
$105.60 – $5.28 = $100.32, the net proceeds.

18. The amount of the sale = 2250 × 22¢ = $495;
5% of $495 = $24.75, the commission;
$495 − $24.75 = $470.25, the net proceeds.

19. The amount of the sale = 1760 × 13¢ = $228.80;
10% of $228.80 = $22.88, the commission;
$228.80 − $22.88 = $205.92, the net proceeds.

20. The amount of the sale = 2450 × 16¢ = $392;
5% of $392 = $19.60, the commission;
$392 − $19.60 = $372.40, the net proceeds.

21. He collected 80% of $2500, or $2000;
The commission = 10% of $2000 = $200;
Hence, the creditor received $2000 − $200 = $1800.

Page 252

22. 2¾% of $105,620 = $2904.55, the income.

23. Since 2½% of the amount of business = $125, the amount of business = $125 ÷ .02½ = $5000.

24. The commission = $5000 − $4875 = $125;
$125 ÷ $5000 = .02½; that is, $125 is .02½, or 2½%, of $5000;
Hence, the commission was 2½%.

25. The amount of the sale = $2451 + $129 = $2580;
$129 ÷ $2580 = .05; that is, $129 is 5% of $2580;
Hence the commission was 5%.

26. The amount of the sale = 80 × $24 = $1920;
4¼% of $1920 = $81.60, the commission.

27. The amount of the purchase = 14 × $3200 = $44,800;
The agent received 1½% of $44,800 = $672.

28. $1½ ÷ $37½ = .04; that is, $1½ is 4% of $37½;
Hence, the commission was 4%.

29. His total commission = 1¾% + 3¼% = 5%;
5% of $24,000 = $1200, his commission.

30. $3000 ÷ $120,000 = .025; that is, $3000 is 2½% of $120,000;
Hence, the commission was 2½%.

31. Since $189 is 3½% of the amount of the sale, the amount = $189 ÷ .03½ = $5400. The number of bushels = $5400 ÷ $.30, or 18,000 bu.

32. The amount of the sale = 150 × $12.30 = $1845;
2¾% of $1845 = $50.7375, or $50.74 the commission;
The expense of cartage and storage = 150 × 14¢ = $21;
The total deductions = $50.74 + $77 + $21 = $148.74;
$1845 − $148.74 = $1696.26, the net proceeds.

Page 253

2. $20\% \text{ of } \$25 = \$5$, the first discount;
$\$25 - \$5 = \$20$, the price after the first discount;
$10\% \text{ of } \$20 = \$2$, the second discount;
$\$20 - \$2 = \$18$, the net price.

3. $5\% \text{ of } \$40 = \$2$, the first discount;
$\$40 - \$2 = \$38$, the price after the first discount;
$15\% \text{ of } \$38 = \$5.70$, the second discount;
$\$38 - \$5.70 = \$32.30$, the net price.

4. $33\frac{1}{3}\% \text{ of } \$8.40 = \$2.80$, the first discount;
$\$8.40 - \$2.80 = \$5.60$, the price after the first discount;
$12\frac{1}{2}\% \text{ of } \$5.60 = \$.70$, the second discount;
$\$5.60 - \$.70 = \$4.90$, the net price.

5. $40\% \text{ of } \$5.70 = \$2.28$, the first discount;
$\$5.70 - \$2.28 = \$3.42$, the price after the first discount;
$16\frac{2}{3}\% \text{ of } \$3.42 = \$.57$, the second discount;
$\$3.42 - \$.57 = \$2.85$, the net price.

6. $30\% \text{ of } \$24 = \$7.20$, the first discount;
$\$24 - \$7.20 = \$16.80$, the price after the first discount;
$10\% \text{ of } \$16.80 = \$1.68$, the second discount;
$\$16.80 - \$1.68 = \$15.12$, the net price;
$3 \times \$15.12 = \$45.36$, the net cost;
The total discount $= 3 \times (\$7.20 + \$1.68) = \$26.64$.

7. $33\frac{1}{3}\% \text{ of } \$9 = \$3$, the first discount;
$\$9 - \$3 = \$6$, the price after the first discount;
$5\% \text{ of } \$6 = \$.30$, the second discount;
$\$6 - \$.30 = \$5.70$, the net price;
$4\frac{1}{2} \times \$5.70 = \$25.65$, the net cost;
The total discount $= 4\frac{1}{2} \times (\$3 + \$.30) = \$14.85$.

8. $40\% \text{ of } \$6.50 = \$2.60$, the first discount;
$\$6.50 - \$2.60 = \$3.90$, the price after the first discount;
$10\% \text{ of } \$3.90 = \$.39$, the second discount;
$\$3.90 - \$.39 = \$3.51$, the net price;
$6 \times \$3.51 = \$21.06$, the net cost;
The total discount $= 6 \times (\$2.60 + \$.39) = \$17.94$.

9. $35\% \text{ of } \$8 = \$2.80$, the first discount;
$\$8 - \$2.80 = \$5.20$, the price after the first discount;
$20\% \text{ of } \$5.20 = \$1.04$, the second discount;
$\$5.20 - \$1.04 = \$4.16$, the net price;
$5\frac{1}{2} \times \$4.16 = \$22.88$, the net cost;
The total discount $= 5\frac{1}{2} \times (\$2.80 + \$1.04) = \$21.12$.

10. 60 % of $10 = $6, the first discount;
$10 – $6 = $4, the price after the first discount;
10 % of $4 = $.40, the second discount;
$4 – $.40 = $3.60, the price after the second discount;
5 % of $3.60 = $.18, the third discount;
$3.60 – $.18 = $3.42, the net price;
15 × $3.42 = $51.30, the net cost;
The total discount = 15 × ($6 + $.40 + $.18) = $98.70.

Page 254

11. 40 % of $300 = $120, the first discount;
$300 – $120 = $180, the price after the first discount;
10 % of $180 = $18, the second discount; then,
The list price = $180 – $18 = $162, the amount received.

12. 20 % of $16 = $3.20, the first discount;
$16 – $3.20 = $12.80, the price after the first discount;
12½ % of $12.80 = $1.60, the second discount;
$12.80 – $1.60 = $11.20, the net price;
Hence, the net cost = 2½ × $11.20 = $28.

13. 40 % of $30 = $12, the first discount;
$30 – $12 = $18, the price after the first discount;
10 % of $18 = $1.80, the special discount; then,
The net cost = $18 – $1.80 = $16.20.

14. The first discount = 20 % of $15 = $3;
$15 – $3 = $12, the price after the first discount;
The second discount = 7½ % of $12 = $.90; then,
The discount on each dozen = $3 + $.90 = $3.90; and,
The total discount = 4½ × $3.90 = $17.55.

15. 200 × 30¢ = $60, the cost at list price;
15 % of $60 = $9, the first discount;
$60 – $9 = $51, the cost after the first discount;
5 % of $51 = $2.55, the second discount; then,
The net cost = $51 – $2.55 = $48.45.

16. 25 % of $6 = $1.50, the first discount;
$6 – $1.50 = $4.50, the price after the first discount;
20 % of $4.50 = $.90, the second discount;
$4.50 – $.90 = $3.60, the net price; then,
The net cost = 60 × $3.60 = $216.

17. 25% of $15.20 = $3.80, the first discount;
$15.20 − $3.80 = $11.40, the price after the first discount;
5% of $11.40 = $.57, the second discount;
$11.40 − $.57 = $10.83, the net price; then,
The net cost = 6 × $10.83 = $64.98.

18. 96 × 25¢ = $24, the cost at list price;
25% of $24 = $6, the first discount;
$24 − $6 = $18, the cost after the first discount;
5% of $18 = $.90, the second discount; then,
The net cost = $18 − $.90 = $17.10, the amount I paid.

19. 60% of $16.50 = $9.90, the first discount;
$16.50 − $9.90 = $6.60, the price after the first discount;
10% of $6.60 = $.66, the second discount;
$6.60 − $.66 = $5.94, the net price; then,
The net cost = 2 × $5.94 = $11.88, the sum paid.

20. 72 × 30¢ = $21.60, the cost at list price;
75% of $21.60 = $16.20, the first discount;
$21.60 − $16.20 = $5.40, the cost after the first discount;
10% of $5.40 = $.54, the second discount;
Hence, the net cost = $5.40 − $.54 = $4.86.

21. 720 × 15¢ = $108, the cost at list price;
70% of $108 = $75.60, the first discount;
$108 − $75.60 = $32.40, the cost after the first discount;
2½% of $32.40 = $.81, the second discount; then,
The net cost = $32.40 − $.81 = $31.59.

22. 150 × $1.10 = $165; 2 × $3.50 = $7; $165 + $7 = $172, the total cost at list price;
15% of $172 = $25.80, the first discount;
$172 − $25.80 = $146.20, the cost after the first discount;
5% of $146.20 = $7.31, the discount for cash; then,
The net cost = $146.20 − $7.31 = $138.89.

23. 2.5 × $3.20 = $8, the cost at list price;
10% of $8 = $.80, the first discount;
$8 − $.80 = $7.20, the cost after the first discount;
2½% of $7.20 = $.18, the discount for cash; then,
The net cost ≐ $7.20 − $.18 = $7.02.

Page 255

1. 20% of $200 = $40, the first discount;
$200 − $40 = $160, the amount after the first discount;
5% of $160 = $8, the second discount;
$160 − $8 = $152, the net amount.

2. 25% of $400 = $100, the first discount;
   $400 – $100 = $300, the amount after the first discount;
   10% of $300 = $30, the second discount;
   $300 – $30 = $270, the net amount.
3. 10% of $600 = $60, the first discount;
   $600 – $60 = $540, the amount after the first discount;
   10% of $540 = $54, the second discount;
   $540 – $54 = $486, the net amount.
4. 15% of $300 = $45, the first discount;
   $300 – $45 = $255, the amount after the first discount;
   20% of $255 = $51, the second discount;
   $255 – $51 = $204, the net amount.
5. 50% of $720 = $360, the first discount; also the amount left;
   10% of $360 = $36, the second discount;
   $360 – $36 = $324, the net amount.
6. 12% of $850 = $102, the first discount;
   $850 – $102 = $748, the amount after the first discount;
   18% of $748 = $134.64, the second discount;
   $748 – $134.64 = $613.36, the net amount.
7. 5% of $230 = $11.50, the first discount;
   $230 – $11.50 = $218.50, the amount after the first discount;
   2% of $218.50 = $4.37, the second discount;
   $218.50 – $4.37 = $214.13, the net amount.
8. 16⅔% of $498 = $83, the first discount;
   $498 – $83 = $415, the amount after the first discount;
   4% of $415 = $16.60, the second discount;
   $415 – $16.60 = $398.40, the net amount.
9. 37½% of $560 = $210, the first discount;
   $560 – $210 = $350, the amount after the first discount;
   15% of $350 = $52.50, the second discount;
   $350 – $52.50 = $297.50, the net amount.
10. 12½% of $744 = $93, the first discount;
    $744 – $93 = $651, the amount after the first discount;
    33⅓% of $651 = $217, the second discount;
    $651 – $217 = $434, the net amount.
11. 10% of $1000 = $100, the first discount;
    $1000 – $100 = $900, the amount after the first discount;
    10% of $900 = $90, the second discount;
    $900 – $90 = $810, the amount after the second discount;
    5% of $810 = $40.50, the third discount;
    $810 – $40.50 = $769.50, the net amount.

12. 25% of $2400 = $600, the first discount;
$2400 – $600 = $1800, the amount after the first discount;
20% of $1800 = $360, the second discount;
$1800 – $360 = $1440, the amount after the second discount;
8% of $1440 = $115.20, the third discount;
$1440 – $115.20 = $1324.80, the net amount.

13. 35% of $320 = $112, single discount;
20% of $320 = $64, the first discount;
$320 – $64 = $256, the amount after the first discount;
15% of $256 = $38.40, the second discount;
The two successive discounts = $64 + $38.40 = $102.40;
Hence, the single discount is $112 – $102.40, or $9.60, more.

14. 40% of $350 = $140, the first discount;
$350 – $140 = $210, the amount after the first discount;
10% of $210 = $21, the second discount;
Hence, the total discount = $140 + $21 = $161.

15. 33⅓% of $475.50 = $158.50, the first discount;
$475.50 – $158.50 = $317, the amount after the first discount;
5% of $317 = $15.85, the discount for cash; then,
The net amount = $317 – $15.85 = $301.15, the cash payment.

16. 90% of $840 = $756, the first discount;
$840 – $756 = $84, the amount after the first discount;
10% of $84 = $8.40, the second discount;
$84 – $8.40 = $75.60, the net amount.

17. 12½% of $1280 = $160, the first discount;
$1280 – $160 = $1120, the amount after the first discount;
30% of $1120 = $336, the second discount;
Hence, the total discount = $160 + $336 = $496.

18. 75% of $496 = $372, the first discount;
$496 – $372 = $124, the amount after the first discount;
10% of $124 = $12.40, the second discount;
$124 – $12.40 = $111.60, the amount after the second discount;
5% of $111.60 = $5.58, the discount for cash;
Hence, the net amount = $111.60 – $5.58 = $106.02.

Page 256

20. 8 grindstones cost 8 × $5.50 = $44; 15 oilstones cost 15 × 60¢ = $9;
1⅔ doz. scythes cost 1⅔ × $6 = $10; hence,
the gross amount = $44 + $9 + $10 = $63;
33⅓% of $63 = $21, the first discount;

$63 – $21 = $42, the amount after the first discount ;
10% of $42 = $4.20, the second discount ;
$42 – $4.20 = $37.80, the net amount.

21. 72 sets irons cost 72 × $1.50 = $108 ; 36 teakettles cost 36 × 65¢ = $23.40 ; 60 coffeepots cost 60 × 45¢ = $27 ; 3 gross egg beaters cost 3 × $10.20 = $30.60 ; hence,

The gross amount = $108 + $23.40 + $27 + $30.60 = $189 ;
40% of $189 = $75.60, the first discount ;
$189 – $75.60 = $113.40, the amount after the first discount ;
15% of $113.40 = $17.01, the second discount ;
$113.40 – $17.01 = $96.39, the net amount.

22. 3 doz. hammers cost 3 × $6 = $18 ; 2½ doz. screwdrivers cost 2½ × $7 = $17.50 ; 1¾ doz. saws cost 1¾ × $16 = $28 ; 15 planes cost 15 × $1.90 = $28.50 ; hence,

The gross amount = $18 + $17.50 + $28 + $28.50 = $92 ;
25% of $92 = $23, the first discount ;
$92 – $23 = $69, the amount after the first discount ;
10% of $69 = $6.90, the second discount ;
$69 – $6.90 = $62.10, the net amount.

23. 30 tablecloths cost 30 × $3.50 = $105 ; 40 doz. napkins cost 40 × $3 = $120 ; 60 doz. handkerchiefs cost 60 × $2.25 = $135 ; hence,

The gross amount = $105 + $120 + $135 = $360 ;
15% of $360 = $54, the first discount ;
$360 – $54 = $306, the amount after the first discount ;
5% of $306 = $15.30, the second discount ;
$306 – $15.30 = $290.70, the net amount.

Page 257

1. $\frac{whe}{weo}$ means $\frac{\$1.25}{\$1.50}$; then, \$1.50 – \$1.25 = \$.25, the gain;
\$.25 ÷ \$1.25 = $\frac{1}{5}$; that is, \$.25 is $\frac{1}{5}$, or 20%, of \$1.25 ;
Hence, the gain is 20%.

2. $\frac{hto}{iho}$ means $\frac{\$2.40}{\$3.20}$; then, \$3.20 – \$2.40 = \$.80, the gain ;
\$.80 ÷ \$2.40 = $\frac{1}{3}$; that is, \$.80 is $\frac{1}{3}$, or 33⅓%, of \$2.40 ;
Hence, the gain is 33⅓%.

3. $\frac{tm}{et}$ means $\frac{48¢}{54¢}$; then, 54¢ – 48¢ = 6¢, the gain ;
6¢ ÷ 48¢ = $\frac{1}{8}$; that is, 6¢ is $\frac{1}{8}$, or 12½%, of 48¢ ;
Hence, the gain is 12½%.

4. $\frac{ae}{who}$ means $\frac{\$.75}{\$1.20}$; then, $\$1.20 - \$.75 = \$.45$, the gain;
$45¢ \div 75¢ = \frac{3}{5}$; that is, $45¢$ is $\frac{3}{5}$, or 60%, of $75¢$;
Hence, the gain is 60%.

5. $\frac{st}{mk}$ means $\frac{64¢}{88¢}$; then, $88¢ - 64¢ = 24¢$, the gain;
$24¢ \div 64¢ = \frac{3}{8}$; that is, $24¢$ is $\frac{3}{8}$, or $37\frac{1}{2}\%$, of $64¢$;
Hence, the gain is $37\frac{1}{2}\%$.

6. $\frac{is}{th}$ means $\frac{36¢}{42¢}$; then, $42¢ - 36¢ = 6¢$, the gain;
$6¢ \div 36¢ = \frac{1}{6}$; that is, $6¢$ is $\frac{1}{6}$, or $16\frac{2}{3}\%$, of $36¢$;
Hence, the gain is $16\frac{2}{3}\%$.

7. $\frac{hke}{hmk}$ means $\frac{\$2.25}{\$2.88}$; then, $\$2.88 - \$2.25 = \$.63$, the gain;
$\$.63 \div \$2.25 = .28$; that is, $\$.63$ is $.28$, or 28%, of $\$2.25$;
Hence, the gain is 28%.

8. $\frac{ito}{the}$ means $\frac{\$3.40}{\$4.25}$; then, $\$4.25 - \$3.40 = \$.85$, the gain;
$\$.85 \div \$3.40 = .25$ that is, $\$.85$ is $.25$, or 25%, of $\$3.40$;
Hence, the gain is 25%.

9. $\frac{iaeo}{tihe}$ means $\frac{\$37.50}{\$43.25}$; then, $\$43.25 - \$37.50 = \$5.75$, the gain;
$\$5.75 \div \$37.50 = .15\frac{1}{3}$; that is, $\$5.75$ is $.15\frac{1}{3}$, or $15\frac{1}{3}\%$, of $\$37.50$;
Hence, the gain is $15\frac{1}{3}\%$.

10. $\frac{etae}{samh}$ means $\frac{\$54.75}{\$67.89}$; then, $\$67.89 - \$54.75 = \$13.14$, the gain;
$\$13.14 \div \$54.75 = .24$; that is, $\$13.14$ is $.24$, or 24%, of $\$54.75$;
Hence, the gain is 24%.

11. *ht* means $24¢$; since the gain $= 33\frac{1}{3}\%$ of $24¢$, or $8¢$, the selling price $= 24¢ + 8¢$, or $32¢$; $32¢$ is written *ih*; hence, the complete mark is $\frac{ht}{ih}$.

12. *sb* means $69¢$; since the gain $= 33\frac{1}{3}\%$ of $69¢$, or $23¢$, the selling price $= 69¢ + 23¢$, or $92¢$; $92¢$ is written *bh*; hence, the complete mark is $\frac{sb}{bh}$.

13. *tih* means $\$4.32$; since the gain $= 33\frac{1}{3}\%$ of $\$4.32$, or $\$1.44$, the selling price $= \$4.32 + \$1.44$, or $\$5.76$, written *eas*; hence, the complete mark is $\frac{tih}{eas}$.

14. *sbo* means \$6.90; since the gain = 33⅓ % of \$6.90, or \$2.30, the selling price = \$6.90 + \$2.30, or \$9.20, written *bho*; hence, the complete mark is $\frac{sbo}{bho}$.

15. *wtk* means \$1.44; since the gain = 33⅓ % of \$1.44, or \$.48, the selling price = \$1.44 + \$.48, or \$1.92, written *wbh*; hence, the complete mark is $\frac{wtk}{wbh}$.

16. *amb* means \$7.89; since the gain = 33⅓ % of \$7.89, or \$2.63, the selling price = \$7.89 + \$2.63, or \$10.52, written *woeh*; hence, the complete mark is $\frac{amb}{woeh}$.

17. *bs* means 96¢; since the gain = 33⅓ % of 96¢, or 32¢, the selling price = 96¢ + 32¢, or \$1.28, written *whm*; hence, the complete mark is $\frac{bs}{whm}$.

18. *wih* means \$1.32; since the gain = 33⅓ % of \$1.32, or \$.44, the selling price = \$1.32 + \$.44, or \$1.76, written *was*; hence, the complete mark is $\frac{wih}{was}$.

19. *hmks* means \$28.86; since the gain = 33⅓ % of \$28.86, or \$9.62, the selling price = \$28.86 + \$9.62, or \$38.48, written *imtm*; hence, the complete mark is $\frac{hmks}{imtm}$.

20. *tsie* means \$46.35; since the gain = 33⅓ % of \$46.35, or \$15.45, the selling price = \$46.35 + \$15.45, or \$61.80, written *swmo*; hence, the complete mark is $\frac{tsie}{swmo}$.

Page 258

21. *tm* means 48¢; the cost plus 20 % of it = 120 %, or $\frac{6}{5}$, of it = 48¢; 48¢ ÷ $\frac{6}{5}$ = 40¢, the cost, written *to*; hence the complete mark is $\frac{to}{tm}$.

22. *sk* means 66¢; the cost plus 20 % of it = 120 %, or $\frac{6}{5}$, of it = 66¢; 66¢ ÷ $\frac{6}{5}$ = 55¢, the cost, written *ek*; hence, the complete mark is $\frac{ek}{sk}$.

23. *iok* means \$3.00; the cost plus 20 % of it = 120 %, or $\frac{6}{5}$, of it = \$3.00; \$3.00 ÷ $\frac{6}{5}$ = \$2.50, the cost, written *heo*; hence, the complete mark is $\frac{heo}{iok}$.

24. *aeo* means $7.50; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = $7.50; $7.50 ÷ $\frac{6}{5}$ = $6.25, the cost, written *she*; hence, the complete mark is $\frac{she}{aeo}$.

25. *mt* means 84¢; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = 84¢; 84¢ ÷ $\frac{6}{5}$ = 70¢, the cost, written *ao*; hence, the complete mark is $\frac{ao}{mt}$.

26. *bs* means 96¢; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = 96¢; 96¢ ÷ $\frac{6}{5}$ = 80¢, the cost, written *mo*; hence, the complete mark is $\frac{mo}{bs}$.

27. *ith* means $3.42; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = $3.42; $3.42 ÷ $\frac{6}{5}$ = $2.85, the cost, written *hme*; hence, the complete mark is $\frac{hme}{ith}$.

28. *tbm* means $4.98; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = $4.98; $4.98 ÷ $\frac{6}{5}$ = $4.15, the cost, written *twe*; hence, the complete mark is $\frac{twe}{tbm}$.

29. *is* means 36¢; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = 36¢; 36¢ ÷ $\frac{6}{5}$ = 30¢, the cost, written *io*; hence, the complete mark is $\frac{io}{is}$.

30. *smts* means $68.46; the cost plus 20% of it = 120%, or $\frac{6}{5}$, of it = $68.46. $68.46 ÷ $\frac{6}{5}$ = $57.05, the cost, written *eaoe*; hence, the complete mark is $\frac{eaoe}{smts}$.

31. 24¢ is written *ht*; the selling price = 24¢ plus 37½% of 24¢ = 33¢, written *ik*; hence, the complete mark is $\frac{ht}{ik}$.

32. 40¢ is written *to*; the selling price = 40¢ plus 37½% of 40¢ = 55¢, written *ek*; hence, the complete mark is $\frac{to}{ek}$.

33. 88¢ is written *mk*; the selling price = 88¢ plus 37½% of 88¢ = $1.21, written *whw*; hence, the complete mark is $\frac{mk}{whw}$.

34. 96¢ is written *bs*; the selling price = 96¢ plus 37½% of 96¢ = $1.32, written *wih*; hence, the complete mark is $\frac{bs}{wih}$.

35. $2.80 is written *hmo*; the selling price = $2.80 plus 37½% of $2.80 = $3.85, written *ime*; hence, the complete mark is $\frac{hmo}{ime}$.

36. $7.20 is written *aho*; the selling price = $7.20 plus 37½% of $7.20 = $9.90, written *bko*; hence, the complete mark is $\frac{aho}{bko}$.

37. \$4.48 is written *tkm*; the selling price = \$4.48 plus 37½ % of \$4.48 = \$6.16, written *sws*; hence, the complete mark is $\frac{tkm}{sws}$.

38. \$6.80 is written *smo*; the selling price = \$6.80 plus 37½ % of \$6.80 = \$9.35, written *bie*; hence, the complete mark is $\frac{smo}{bie}$.

39. \$176 is written *was*; the selling price = \$176 plus 37½ % of \$176 = \$242, written *hth*; hence, the complete mark is $\frac{was}{hth}$.

40. \$224 is written *hkt*; the selling price = \$224 plus 37½ % of \$224 = \$308, written *iom*; hence, the complete mark is $\frac{hkt}{iom}$.

42. 32¢ is written *ih*; the selling price = 32¢ plus 25% of 32¢ = 40¢; the marked price less 20% of it = 80%, or ⅘, of it = 40¢; then, the marked price = 40¢ ÷ ⅘ = 50¢, written *eo*; hence, the complete mark is $\frac{ih}{eo}$.

43. 72¢ is written *ah*; the selling price = 72¢ plus 25% of 72¢ = 90¢; the marked price less 10% of it = 90% of it = 90¢; then, the marked price = 90¢ ÷ .90 = \$1.00, written *wok*; hence, the complete mark is $\frac{ah}{wok}$.

44. \$48 is written *tm*; the selling price = \$48 plus 25% of \$48 = \$60; the marked price less 25% of it = 75%, or ¾, of it = \$60; then, the marked price = \$60 ÷ ¾ = \$80, written *mo*; hence, the complete mark is $\frac{tm}{mo}$.

45. \$3.40 is written *ito*; the selling price = \$3.40 plus 25% of \$3.40 = 4.25; the marked price less 15% of it = 85% of it = \$4.25; then, the marked price = \$4.25 ÷ .85 = \$5.00, written *eok*; hence, the complete mark is $\frac{ito}{eok}$.

46. \$6.72 is written *sah*; the selling price = \$6.72 + 25% of \$6.72 = \$8.40; the marked price less 12½ % of it = 87½ %, or ⅞, of it = \$8.40; then, the marked price = \$8.40 ÷ ⅞ = \$9.60, written *bso*; hence, the complete mark is $\frac{sah}{bso}$.

47. \$8.40 is written *mto*; the selling price = \$8.40 + 25% of \$8.40 = \$10.50; the marked price less 16⅔ % of it = 83⅓ %, or ⅚, of it = \$10.50; then, the marked price = \$10.50 ÷ ⅚ = \$12.60, written *whso*; hence, the complete mark is $\frac{mto}{whso}$.

48. The cost of 1 hat = \$21 ÷ 12 = \$1.75, written *blh*;
The selling price = \$1.75 plus 40% of \$1.75 = \$2.45, written *hte*;
Hence, the complete mark is $\frac{blh}{hte}$.

49. The cost of 1 cap = $15.60 ÷ 12 = $1.30, written *bre*;
The selling price = $1.30 plus 40 % of $1.30 = $1.82, written *wmh*;
Hence, the complete mark is $\frac{bre}{wmh}$.

50. The cost of 1 scarf = $24 ÷ 12 = $2.00, written *ien*;
The selling price = $2.00 plus 40 % of $2.00 = $2.80, written *hmo*;
Hence, the complete mark is $\frac{ien}{hmo}$.

51. The cost of 1 necktie = $7.20 ÷ 12 = $.60, written *pe*;
The selling price = 60¢ plus 40 % of 60¢ = 84¢, written *mt*;
Hence, the complete mark is $\frac{pe}{mt}$.

52. The cost of 1 shirt = $18 ÷ 12 = $1.50, written *bhe*;
The selling price = $1.50 plus 40 % of $1.50 = $2.10, written *hwo*;
Hence, the complete mark is $\frac{bhe}{hwo}$.

53. The cost of 1 pair =$16.80 ÷ 12 = $1.40, written *bte*;
The selling price = $1.40 plus 40 % of $1.40 = $1.96, written *wbs*;
Hence, the complete mark is $\frac{bte}{wbs}$.

54. The cost of 1 pair = $30 ÷ 12 = $2.50, written *ihe*;
The selling price = $2.50 plus 40 % of $2.50 = $3.50, written *ieo*;
Hence, the complete mark is $\frac{ihe}{ieo}$.

55. The cost of 1 pair = $8.40 ÷ 12 = $.70, written *le*;
The selling price = 70¢ plus 40 % of 70¢ = 98¢, written *bm*;
Hence, the complete mark is $\frac{le}{bm}$.

Page 262

2. 6 % of $350 = $21.00, int. for 1 yr.
½ of int. for 1 yr. = 10.50, int. for 6 mo.
$31.50, int. for 1 yr. 6 mo.
$350 + $31.50 = $381.50, the amount.

3. 4 % of $475 = $19.00, int. for 1 yr.
2 × $19.00 = $38.00, int. for 2 yr.
¼ of int. for 1 yr. = 4.75, int. for 3 mo.
$42.75, int. for 2 yr. 3 mo.
$475 + $42.75 = $517.75, the amount.

4. 3% of $3000 = $90.00, int. for 1 yr.
4 × $90.00 = $360.00, int. for 4 yr.
⅓ of int. for 1 yr. = 30.00, int. for 4 mo.
¼ of int. for 4 mo. = 7.50, int. for 1 mo.
$397.50, int. for 4 yr. 5 mo.
$3000 + $397.50 = $3397.50, the amount.

5. 7% of $6400 = $448.00, int. for 1 yr.
3 × $448.00 = $1344.00, int. for 3 yr.
⅓ of int. for 1 yr. = 149.333, int. for 4 mo.
$1493.33 , int. for 3 yr. 4 mo.
$6400 + $1493.33 = $7893.33, the amount.

6. 8% of $46.50 = $3.72, int. for 1 yr.
2 × $3.72 = $7.44, int. for 2 yr.
⅙ of int. for 1 yr. = .62, int. for 2 mo.
$8.06, int. for 2 yr. 2 mo.
$46.50 + $8.06 = $54.56, the amount.

7. 5% of $85.25 = $4.2625, int. for 1 yr.
3 × $4.2625 = $12.788, int. for 3 yr.
½ of int. for 1 yr. = 2.131, int. for 6 mo.
⅙ of int. for 6 mo. = .355, int. for 1 mo.
$15.27 , int. for 3 yr. 7 mo.
$85.25 + $15.27 = $100.52, the amount.

8. 3½% of $10,000 = $350.00, int. for 1 yr.
½ of int. for 1 yr. = 175.00, int. for 6 mo.
½ of int. for 6 mo. = 87.50, int. for 3 mo.
$612.50, int. for 1 yr. 9 mo.
$10,000 + $612.50 = $10,612.50, the amount.

9. 2¼% of $42,000 = $945.00, int. for 1 yr.
2 × $945.00 = $1890.00, int. for 2 yr.
½ of int. for 1 yr. = 472.50, int. for 6 mo.
⅓ of int. for 6 mo. = 157.50, int. for 2 mo.
$2520.00, int. for 2 yr. 8 mo.
$42,000 + $2520 = $44,520. the amount.

10. 6% of $585.75 = $35.145. int. for 1 yr.
½ of int. for 1 yr. = 17.573, int. for 6 mo.
$52.72 , int. for 1 yr. 6 mo.
$585.75 + $52.72 = $638.47, the amount.

11. 4 % of $648.50 = $25.94, int. for 1 yr.
3 × $25.94 = $77.82 , int. for 3 yr.
$\frac{1}{3}$ of int. for 1 yr. = 8.647, int. for 4 mo.
$\frac{1}{4}$ of int. for 4 mo. = 2.162, int. for 1 mo.
$88.63 , int. for 3 yr. 5 mo.
$648.50 + $88.63 = $737.13, the amount.

12. The time from Jan. 1, 1905 to Nov. 1, 1906 = 1 yr. 10 mo.
5 % of $350.80 = $17.54 , int. for 1 yr.
$\frac{1}{2}$ of int. for 1 yr. = 8.77 , int. for 6 mo.
$\frac{1}{3}$ of int. for 1 yr. = 5.847, int. for 4 mo.
$32.16 , int. for 1 yr. 10 mo.
$350.80 + $32.16 = $382.96, the amount.

13. The time from Apr. 9, 1904 to Mar. 9, 1906 = 1 yr. 11 mo.
6 % of $540.96 = $32.458, int. for 1 yr.
$\frac{1}{2}$ of int. for 1 yr. = 16.229, int. for 6 mo.
$\frac{1}{3}$ of int. for 1 yr. = 10.819, int. for 4 mo.
$\frac{1}{4}$ of int. for 4 mo. = 2.705, int. for 1 mo.
$62.21 , int. for 1 yr. 11 mo.
$540.96 + $62.21 = $603.17, the amount.

Page 263

2. 5 % of $60.24 = $3.012, int. for 1 yr.
2 × $3.012 = $6.024, int. for 2 yr.
$\frac{1}{3}$ of int. for 1 yr. = 1.004, int. for 4 mo.
$\frac{1}{8}$ of int. for 4 mo. = .126, int. for 15 da.
$7.15 , int. for 2 yr. 4 mo. 15 da.
$60.24 + $7.15 = $67.39, the amount.

3. 6 % of $45.48 = $2.729, int. for 1 yr.
3 × $2.729 = $8.187, int. for 3 yr.
$\frac{1}{3}$ of int. for 1 yr. = .910, int. for 4 mo.
$\frac{1}{4}$ of int. for 4 mo. = .227, int. for 1 mo.
$\frac{1}{3}$ of int. for 1 mo. = .076, int. for 10 da.
$9.40 , int. for 3 yr. 5 mo. 10 da.
$45.48 + $9.40 = $54.88, the amount.

4. 4% of $2800 = $112, int. for 1 yr.
2 × $112 = $224.00 , int. for 2 yr.
$\frac{1}{2}$ of int. for 1 yr. = 56.00 , int. for 6 mo.
$\frac{1}{12}$ of int. for 6 mo. = 4.667, int. for 15 da.
$284.67 , int. for 2 yr. 6 mo. 15 da.
$2800 + $284.67 = $3084.67, the amount.

5. 6% of $5000 = $300, int. for 1 yr.
3 × $300 = $900.00 , int. for 3 yr.
$\frac{1}{2}$ of int. for 1 yr. = 150.00 , int. for 6 mo.
$\frac{1}{3}$ of int. for 6 mo. = 50.00 , int. for 2 mo.
$\frac{1}{6}$ of int. for 2 mo. = 8.333, int. for 10 da.
$\frac{1}{10}$ of int. for 10 da. = .833, int. for 1 da.
$1109.17 , int. for 3 yr. 8 mo. 11 da.
$5000 + $1109.17 = $6109.17, the amount.

6. 5% of $720.16 = $36.008, int. for 1 yr.
5 × $36.008 = $180.04 , int. for 5 yr.
$\frac{1}{2}$ of int. for 1 yr. = 18.004, int. for 6 mo.
$\frac{1}{6}$ of int. for 6 mo. = 3.001, int. for 1 mo.
$\frac{1}{2}$ of int. for 1 mo. = 1.50 , int. for 15 da.
$\frac{1}{5}$ of int. for 15 da. = .30 , int. for 3 da.
$202.85 , int. for 5 yr. 7 mo. 18 da.
$720.16 + $202.85 = $923.01 , the amount.

7. 4% of $468.36 = $18.734, int. for 1 yr.
3 × $18.734 = $56.202, int. for 3 yr.
$\frac{1}{2}$ of int. for 1 yr. = 9.367, int. for 6 mo.
$\frac{1}{2}$ of int. for 6 mo. = 4.684, int. for 3 mo.
$\frac{1}{9}$ of int. for 3 mo. = .520, int. for 10 da.
$70.77 , int. for 3 yr. 9 mo. 10 da.
$468.36 + $70.77 = $539.13, the amount.

8. 6% of $25,000 = $1500, int. for 1 yr.
2 × $1500 = $3000, int. for 2 yr.
$\frac{1}{3}$ of int. for 1 yr. = 500, int. for 4 mo.
$\frac{1}{4}$ of int. for 4 mo. = 125, int. for 1 mo.
$\frac{1}{5}$ of int. for 1 mo. = 25, int. for 6 da.
$\frac{1}{5}$ of int. for 1 mo. = 25, int. for 6 da.
$3675, int. for 2 yr. 5 mo. 12 da.
$25,000 + $3675 = $28,675, the amount.

9. 7% of $68,400 = $4788.00, int. for 1 yr.
$\frac{1}{12}$ of int. for 1 yr. = 399.00, int. for 1 mo.
$\frac{1}{2}$ of int. for 1 mo. = 199.50, int. for 15 da.
$\frac{1}{5}$ of int. for 1 mo. = 79.80, int. for 6 da.
$5466.30, int. for 1 yr. 1 mo. 21 da.
$68,400 + $5466.30 = $73,866.30, the amount.

10. 5% of $1436.80 = $71.84, int. for 1 yr.
4 × $71.84 = $287.36 , int. for 4 yr.
$\frac{1}{6}$ of int. for 1 yr. = 11.973, int. for 2 mo.
$\frac{1}{6}$ of int. for 2 mo. = 1.995, int. for 10 da.
$301.33 , int. for 4 yr. 2 mo. 10 da.
$1436.80 + $301.33 = $1738.13, the amount.

11. 6% of $297.45 = $17.847, int. for 1 yr.
2 × $17.847 = $35.694, int. for 2 yr.
$\frac{1}{4}$ of int. for 1 yr. = 4.462, int. for 3 mo.
$\frac{1}{6}$ of int. for 3 mo. = .744, int. for 15 da.
$40.90 , int. for 2 yr. 3 mo. 15 da.
$297.45 + $40.90 = $338.35, the amount.

12. 8% of $634.75 = $50.78, int. for 1 yr.
3 × $50.78 = $152.34 , int. for 3 yr.
$\frac{1}{3}$ of int. for 1 yr. = 16.927, int. for 4 mo.
$\frac{1}{2}$ of int. for 4 mo. = 8.463, int. for 2 mo.
$\frac{1}{10}$ of int. for 2 mo. = .846, int. for 6 da.
$\frac{1}{2}$ of int. for 6 da. = .423, int. for 3 da.
$179.00 , int. for 3 yr. 6 mo. 9 da.
$634.75 + $179.00 = $813.75, the amount.

13. The time from Sept. 7, 1906 to Dec. 31, 1908 = 2 yr. 3 mo. 24 da.
4% of $1500 = $60.00, int. for 1 yr.
2 × $60.00 = $120.00, int. for 2 yr.
$\frac{1}{6}$ of int. for 1 yr. = 10.00, int. for 2 mo.
$\frac{1}{2}$ of int. for 2 mo. = 5.00, int. for 1 mo.
$\frac{1}{2}$ of int. for 1 mo. = 2.50, int. for 15 da.
$\frac{1}{5}$ of int. for 1 mo. = 1.00, int. for 6 da.
$\frac{1}{2}$ of int. for 6 da. = .50, int. for 3 da.
$139.00, int. for 2 yr. 3 mo. 24 da.
$1500 + $139 = $1639, the amount.

Page 264

1. The area in square rods = 30 × 24, or 720 sq. rd.;
The area in acres = 720 ÷ 160, or $4\frac{1}{2}$ A.

2. He set out 120 × 99 plants = 11,880 plants;
The number of plants per acre = 11,880 ÷ $4\frac{1}{2}$, or 2640 plants.

3. 1125 bu. ÷ 120 = $9\frac{3}{8}$ bu., the yield per row.

4. There were as many basketfuls as $\frac{5}{8}$ bu. is contained times in 1125 bu.; that is, 1125 ÷ $\frac{5}{8}$, or 1800 basketfuls;
1800 × $2\frac{1}{2}$¢ = $45, the cost for picking.

5. The total weight in pounds = 1125 × 56 lb. = 63,000 lb.;
The total weight in tons = 63,000 ÷ 2000, or $31\frac{1}{2}$ T;
Then, the yield per acre = $31\frac{1}{2}$ T. ÷ $4\frac{1}{2}$ = 7 T.

6. The number of cans = $31\frac{1}{2}$ × 384, or 12,096 cans.

7. The number of cases = 12,096 ÷ 24, or 504 cases;
504 cases ÷ $4\frac{1}{2}$ = 112 cases, produced per acre.

8. 12,096 × 2¢ = $241.92, the cost of the cans; 504 × 10¢ = $50.40, the cost of the cases; 504 × 15¢ = $75.60, the cost of putting up; hence,
These expenses = $241.92 + $50.40 + $75.60 = $367.92.

9. $4\frac{1}{2}$ × $37.50 = $168.75, the expense for raising; hence,
The total expense = $412.92 + $168.75 = $581.67.

10. 12,096 cans = 1008 doz. cans; 1008 × 75¢ = $756, the sum received;
His gain = $756.00 − $581.67 = $174.33.

11. There would have been as many $\frac{3}{4}$-bu. crates as $\frac{3}{4}$ is contained times in 1125, that is, 1125 ÷ $\frac{3}{4}$, or 1500 crates; 1500 × 22¢ = $330, the amount received; $330 − $213.75 = $116.25, the gain; hence, the actual gain was larger by $174.33 − $116.25, or $58.08.

Page 265

12. 9.500 × $10.50 = $99.75, the cost of the lumber.

13. Since $37\frac{1}{2}\%$, or $\frac{3}{8}$, of the total cost of the derrick = $99.75, the total cost = $99.75 ÷ $\frac{3}{8}$ = $266.

14. 1280 × 55¢ = $704, the cost of drilling.

15. 1280 × 12¢ = $153.60, the rent of the machinery.

16. 250 × 45¢ = $112.50, the cost of the casing.

17. 1280 × $15\frac{1}{2}$¢ = $198.40, the cost of the tubing.

18. 1280 × $5\frac{1}{2}$¢ = $70.40, the cost of the pumping rods.

19. 85 × 96¢ = $81.60, the cost of the torpedo.

Page 266

20. The combined cost = \$266.00 + \$704.00 + \$153.60 + \$112.50 + \$198.40 + \$70.40 + \$81.60 + \$24.25 = \$1610.75.

21. 2352 bbl. ÷ 3 = 784 bbl., the yield per week;
784 bbl. ÷ 7 = 112 bbl., the yield per day;
112 bbl. ÷ 24 = $4\frac{2}{3}$ bbl., the yield per hour.

22. The yield per day = 112 bbl. [Ex. 21, solution] = 112 × 42 gal., or 4704 gal.

23. He paid $12\frac{1}{2}$% of 112 bbl., or 14 bbl.;
He had left 112 bbl. − 14 bbl., or 98 bbl.

24. The producer's portion for July = 31 × 98 bbl. = 3038 bbl.; 3038 × \$1.35 = \$4101.30, the value.

25. The total daily yield = 112 bbl. [Ex. 23]; the total yield for July = 31 × 112 bbl. = 3472 bbl.; its value = 3472 × \$1.35 = \$4687.20.

26. The total distance = 23.41 mi. + 25.92 mi. + 25.73 mi. + 45.45 mi. + 51.94 mi. + 62.50 mi. = 234.95 mi.

27. The number of days = 30,800 ÷ 112, or 275 days = 39 wk. 2 da.

28. 3850 bbl. ÷ 30,800 bbl. = .125; that is, 3850 bbl. is $12\frac{1}{2}$% of 30,800 bbl.;
Hence, gasoline, etc., was $12\frac{1}{2}$%.
23,100 bbl. ÷ 30,800 bbl. = .75; that is, 23,100 bbl. is 75% of 30,800 bbl.;
Hence, illuminating oil was 75%.
924 bbl. ÷ 30,800 bbl. = .03; that is, 924 bbl. is 3% of 30,800 bbl.;
Hence, lubricating oil was 3%.
2926 bbl. ÷ 30,800 bbl. = .095; that is, 2926 bbl. is $9\frac{1}{2}$% of 30,800 bbl.;
Hence, residuum and loss was $9\frac{1}{2}$%.

29. 3850 × 42 gal. = 161,700 gal.; 161,700 × $7\frac{1}{2}$¢ = \$12,127.50, the value.

30. The amount in gallons = 23,100 × 42 gal. = 970,200 gal.;
The number of 50-gal. barrels = 970,200 ÷ 50, or 19,404 bbl.

Page 267

31. The amount in gallons = 23,100 × 42 gal. = 970,200;
\$84,892.50 ÷ 970,200 = $8\frac{3}{4}$¢, the price per gallon.

32. $24\frac{3}{8}$ T. = $24\frac{3}{8}$ × 2000 lb. = 48,750 lb.; then,
The number of gallons = 48,750 ÷ $6\frac{1}{2}$, or 7500 gal.

33. The number of cars = 1,200,000 ÷ 7500, or 160 cars.

34. Since (Ex. 32) 1 gal. weighs $6\frac{1}{2}$ lb., 1,200,000 gal. weigh 1,200,000 × $6\frac{1}{2}$ lb., or 7,800,000 lb. = 3900 T.

35. $41\frac{1}{2}$ ft. = 498 in.; $31\frac{1}{2}$ ft. = 378 in.; the number of cases placed end to end in a row the long way of the compartment = 498 in. ÷ $20\frac{3}{4}$ in., or 24 cases; the number of rows = 378 in. ÷ $10\frac{1}{2}$ in., or 36 rows; then, the number of cases = 36 × 24 cases, or 864 cases.

36. Since each case contains two 5-gal. cans, 864 cases will hold 864 × 10 gal. = 8640 gal.

37. $6\frac{1}{4}$ ft. = 75 in.; the number of layers = 75 in. ÷ 15 in., or 5 layers;
Hence, there will be 5 × 8640 gal. = 43,200 gal.

38. 6420 lb. − 2195 lb. = 4225 lb., the weight of the oil; since 1 gal. of oil weighs $6\frac{1}{2}$ lb. (Ex. 32), the number of gallons in 4225 lb. of oil = 4225 lb. ÷ $6\frac{1}{2}$ lb., or 650 gal.

39. 80,830,000 bbl. ÷ 177,000,000 bbl. = $.45\frac{2}{3}$; that is, 80,830,000 bbl. is $45\frac{2}{3}\%$ of 177,000,000 bbl.; hence, $45\frac{2}{3}\%$ was produced by U.S.

Page 268

40. 190,000 lb. = 1900 cwt.; $7790 ÷ 1900 = $4.10, the price per 100 lb.

41. 190,000 lb. ÷ 200 = 950 lb., the average weight per head.
$7790 ÷ 200 = $38.95, the average cost per head.

42. 201,600 lb. − 190,000 lb. = 11,600 lb., the gain in Nov.
213,600 lb. − 201,600 lb. = 12,000 lb., the gain in Dec.
226,400 lb. − 213,600 lb. = 12,800 lb., the gain in Jan.
240,800 lb. − 226,400 lb. = 14,400 lb., the gain in Feb.
256,400 lb. − 240,800 lb. = 15,600 lb., the gain in Mar.

43. Using the answers to Ex. 42:
11,600 lb. ÷ 200 = 58 lb., the average gain per head in Nov.
12,000 lb. ÷ 200 = 60 lb., the average gain per head in Dec.
12,800 lb. ÷ 200 = 64 lb.. the average gain per head in Jan.
14,400 lb. ÷ 200 = 72 lb., the average gain per head in Feb.
15,600 lb. ÷ 200 = 78 lb., the average gain per head in Mar.

44. $228 ÷ 200 = $1.14, the average cost during Nov.
$408.30 ÷ 200 = $2.0415, or $2.04+, the average cost during Dec.

45. Jan.: Corn cost 2200 × 27¢ = $594; hay cost 20 × $6.75 = $135; straw cost 6 × $1.90 = $11.40; salt cost $\frac{3}{4}$ of $1.20 = $.90; hence,

During Jan. feed cost $594 + $135 + $11.40 + $.90 = $741.30.

Feb.: Elevator corn cost 36 × $3 = $108; corn cost 600 × 32¢ = $192; hay cost 18 × $7.50 = $135; hence,

During Feb., feed cost $108 + $192 + $135 + $17.20 = $452.20.

46. Using the answers to Ex. 45:
$741.30 ÷ 200 = $3.7065, or $3.71⁻, the average cost during Jan.;
$452.20 ÷ 200 = $2.261, or $2.26+, the average cost during Feb.

47. 36% of $2850 = $1026; since $5.80 less than $1026 was expended in Mar., feed in that month cost $1026 − $5.80 = $1020.20.

Page 269

48. 256,400 lb. − 190,000 lb. = 66,400 lb., or 664 cwt., the increase in weight; since the total cost of feed = $2850 [Ex. 47], the average cost of producing 100 lb. of beef = $2850 ÷ 664 = $4.292+, or $4.29+.

49. 11,600 lb. = 116 cwt.; $228 ÷ 116 = $1.965+, the cost of 100 lb. in Nov.; 12,000 lb. = 120 cwt.; $408.30 ÷ 120 = $3.4025, the cost of 100 lb. in Dec.;
Hence, the cost in Nov. was less by $3.4025 − $1.965+ = $1.437, or $1.44⁻.

50. 15,600 lb. = 156 cwt.; $1020.20 ÷ 156 = $6.539+, the cost of 100 lb. in Mar.; $3.4025 = the cost of 100 lb. in Dec. [Ex. 49, solution];
Hence, the cost in Mar. was more by $6.539+ − $3.4025 = $3.1365, or $3.14⁻.

51. From Ex. 49 the gain in weight = 11,600 lb. = 116 cwt.; 11,600 lb. was worth 116 × $5.05 = $585.80; since the cost was $228 [Ex. 49], the total profit during Nov. = $585.80 − $228 = $357.80.

14,400 lb., or 144 cwt., was worth 144 × $5.05 = $727.20; since the cost was $452.20, the total profit during Feb. = $727.20 − $452.20 = $275.

52. 12,800 lb., or 128 cwt., was worth 128 × $5.05 = $646.40; since the cost was $741.30, the total loss during Jan. = $741.30 − $646.40 = $94.90.

From Ex. 50 the gain in weight = 15,600 lb. = 156 cwt.; 15,600 lb. was worth 156 × $5.05 = $787.80; since the cost was $1020.20 [Ex. 50], the total loss during Mar. = $1020.20 − $787.80 = $232.40.

53. From Ex. 45 the cost of 36 loads of corn @ $3 = 36 × $3 = $108; 36 loads of damaged corn was worth as much as 36 × 50 bu., or 1800 bu., of 32-cent corn, which would have cost 1800 × 32¢ = $576;
Hence, the amount saved = $576 − $108 = $468.

54. $7790 + $2850 = $10,640, the total cost;
$10,640 ÷ 200 = $53.20, the average cost per head.

55. The freight on 256,400 lb., or 2564 cwt. = 2564 × 10¢ = $256.40.

56. 12 × $10 = $120, the commission.

57. 250,800 lb., or 2508 cwt., of beef sold for 2508 × $5.05 = $12,665.40; the expenses — freight, commission, and feed and care = $256.40 + $120 + $45 = $421.40; then, the net proceeds = $12,665.40 − $421.40 = $12,244.

58. The total shrinkage = 256,400 lb. – 250,800 lb. = 5,600 lb;
The shrinkage per head = 5600 lb. ÷ 200 = 28 lb.

59. The cost, from Ex. 54 = \$7790 + \$2850 = \$10,640;
The net proceeds [Ans. to Ex. 57] = \$12,244; then,
The total gain = \$12,244 – \$10,640 = \$1604.

Page 270

60. 50 × \$5 = \$250, paid for the hogs;
The total cost = \$250 + \$18 = \$268;
12,500 lb., or 125 cwt., sold for 125 × \$4.35 = \$543.75;
Hence, the gain on fattening hogs = \$543.75 – \$268 = \$275.75.

61. The value of the grain fed = 8800 × 28¢ = \$2464; 10% of \$2464 = \$246.40; 74 × \$2 = \$148; hence, the value of fertility restored = \$246.40 + \$148 = \$394.40.

62. The gain on the cattle, \$1604 [Ans. to Ex. 59] plus the gain on the hogs, \$275.75 [Ans. to Ex. 60] plus the gain in fertility restored, \$394.40 [Ans. to Ex. 61] = \$2274.15; the deductions for labor, etc., = \$130 + \$180 + \$85 = \$395; then, the total gain = \$2274.15 – \$395 = \$1879.15.

63. 783 lb. ÷ 1350 lb. = .58; that is, 783 lb. is 58% of 1350 lb.;
Hence, 58% of his weight was beef.

64. 1350 lb., or 13.5 cwt., cost 13.5 × \$5 = \$67.50;
\$67.50 + \$7.50 = \$75, the entire cost;
783 lb., or 7.83 cwt., of beef sold for 7.83 × \$9.50 = \$74.38½, or \$74.39;
The entire proceeds = \$74.39 + \$8.25 + \$5.50 + \$2.25 = \$90.39;
Then, the gain = \$90.39 – \$75 = \$15.39.

65. Neck, 26 lb. @ 5¢ = \$1.30; chuck, 137 lb. at 8¢ = \$10.96; ribs, 73 lb. @ 14¢ = \$10.22; sirloin, 39 lb. @ 20¢ = \$7.80; porterhouse, 94 lb. @ 22¢ = \$20.68; rumps, 39 lb. @ 10¢ = \$3.90; rounds, 122 lb. @ 14¢ = \$17.08; shanks. 26 lb. @ 4¢ = \$1.04; flanks, 47 lb. @ 6¢ = \$2.82; plates, 120 lb. @ 5¢ = \$6; shins, 60 lb. @ 4¢ = \$2.40; hence,

The total value = \$1.30 + \$10.96 + \$10.22 + \$7.80 + \$20.68 + \$3.90 + \$17.08 + \$1.04 + \$2.82 + \$6 + \$2.40 = \$84.20.

Page 271

66. The letter must travel 3250 mi. + 3740 mi. = 6990 mi.

68. 3 hr. 54 min. P.M.
4   46
8 hr. 40 min., or 8:40, P.M., the time of arrival.

4 hr. 46 min. = $4\frac{23}{30}$ hr.; then, the rate per hour = 227 mi. ÷ $4\frac{23}{30}$ = 47.622+ mi., or 47.62 mi.

69. On 1 trip 1 fireman will shovel $\frac{1}{16}$ of 35 T., or $2\frac{3}{16}$ T.;
On 290 trips 1 fireman will shovel 290 × $2\frac{3}{16}$ T. = $634\frac{3}{8}$ T.

70. 12 lb. of sugar @ 6¢ cost 72¢; 3 doz. rubbers @ 8¢ cost 24¢; 200 cu. ft., or .2 M cu. ft., of gas cost $.20; then,

The total cost = $3.25 + $.72 + $.24 + $.20 = $4.41; since 3 doz., or 36, jars of fruit cost $4.41, each jar cost $4.41 ÷ 36 = $$.12\frac{1}{4}$.

71. At 80¢ per 100, 2750 clams cost 27.5 × 80¢ = $22.

72. $\frac{3}{5}$ of 125,000 = 75,000, the number sent by mail; 1 lb. 3 oz. = $1\frac{3}{16}$ lb.; 75,000 × $1\frac{3}{16}$ lb. = $89{,}062\frac{1}{2}$ lb., the weight sent by mail; the cost of postage = $89{,}062\frac{1}{2}$ × 1¢ = $$890.62\frac{1}{2}$, or $890.63.

73. 2000 lb. is $\frac{2000}{2240}$ of 2240 lb.; that is, a short ton is $\frac{2000}{2240}$ of a long ton; then, the cost per short ton = $\frac{2000}{2240}$ of $3.50 = $3.125; the total cost per short ton = $3.125 + $.75 + $1.25 = $5.125; then, the gain per ton = $6.50 − $5.125 = $1.375; $1.375 ÷ $5.125 = $.2683^-$; that is, $1.375 is 26.8% of $5.125; hence, the gain is 26.8%.

74. 198 lb. 10 oz. (troy), or 2386 oz., cost 2386 × $20.67183 = $49,322.98638, or $49,322.99; at 40¢ per $1000, the additional cost = 49.32299 × 40¢ = $19.729196, or $19.73; hence,

The gold cost $49,322.99 + $19.73 = $$49{,}342.72^-$.

Page 272

75. $2\frac{1}{4}$ T. of coal would cost $2\frac{1}{4}$ × $5.60 = $12.60.

76. The number of M cu. ft. = $12.60 ÷ $1.25, or 10.08 M cu. ft.

77. 15% of $12.60 = $1.89, the value utilized in cooking;
$12.60 − $1.89 = $10.71, the value wasted.

78. The quantity of gas giving out as much heat as $2\frac{1}{4}$ T. of coal = $2\frac{1}{4}$ × 15,000 cu. ft. = 33,750 cu. ft.; the quantity of gas giving out the same amount of heat as is *utilized* from $2\frac{1}{4}$ T. of coal = 15% of 33,750 cu. ft. = 5062.5 cu. ft.; but only 90% of the heat of the gas is utilized; hence, 5062.5 cu. ft. is 90% of the quantity required; 5062.5 cu. ft. ÷ .90 = 5625 cu. ft., the quantity needed.

79. 5625 cu. ft. of gas at $1.25 per M [Ex. 76] costs 5.625 × $1.25 = $7.03125, or $7.04; the cost of the coal = $12.60 [Ans. to Ex. 75]; hence, he can save $12.60 − $7.04 = $5.56.

80. The price per ton = $5.60 [Ex. 75]; $3\frac{1}{4}$ × $5.60 = $18.20, the sum paid; then, 15% + 50%, or 65%, of $18.20 = $11.83, the value of the coal utilized.

Page 273

81. 33,000 cu. ft. of gas at $1.25 per M [Ex. 76] costs 33 × $1.25 = $41.25; the coal costs $18.20 [Ex. 80, solution]; he saves $41.25 − $18.20 = $23.05.

82. 2240 lb. ÷ 150 lb. = $\frac{224}{15}$; that is, a long ton is $\frac{224}{15}$ of 150 lb.; since 150 lb. of coal yield 660 cu. ft. of gas, a long ton will yield $\frac{224}{15} \times 660$ cu. ft. = 9856 cu. ft.

83. At $1 per M, 10,000 cu. ft. of gas was worth 10 × $1 = $10;
The number of bushels of coke = 1000 lb. ÷ 40 lb., or 25 bu.;
The value of the coke = 25 × 20¢ = $5;
$\$1.89 \div 56 = \$.03\frac{3}{8}$, the value of 1 gal. of tar;
The value of the tar $= 9\frac{1}{2} \times \$.03\frac{3}{8} = \$.32\frac{1}{16}$; hence,
The total value of the products $= \$10 + \$5 + \$.32\frac{1}{16} + \$7.68 = \$23^{+}$.
$23 − $4 = $19, the increase in value; then,
$19 ÷ $4 = 4.75; that is, $19 is 475% of $4;
Hence, the value of the coal was increased 475%.

84. The cost of drilling = 1120 × $1.10 = $1232;
$1232 ÷ 4 = $308, the cost of drilling for each man;
Then, each man invested $308 + $100 = $408.

85. 18 × $3 = $54, the cost of furnace wood;
6 × $5 = $30, the cost of stove wood; then,
The former annual expense = $54 + $30 + $5 + $1 = $90.

86. 93,750 cu. ft. = 93.75 M cu. ft.; the value of the gas per M cu. ft. = $90 ÷ 93.75 = $.96.

87. Since each man saved $90 per year [Ex. 86] at a total expense of $408 [Ans. to Ex. 84], the number of years it took to pay all expenses $= \$408 \div \$90$, or $4\frac{8}{15}$ yr.

88. As $90 was saved per year [Ex. 86], in 10 yr. the sum saved = 10 × $90 = $900; hence, each man gained $900 − $408 = $492.

Page 274

89. 2 × 6250 lb. = 12,500 lb.; 4 × 5400 lb. = 21,600 lb.; hence, the capacity of all = 12,500 lb. + 21,600 lb. = 34,100 lb.

90. 3.75% of 640 lb. = 24 lb., the amount of butter fat;
24 × 27¢ = $6.48, the sum paid.

91. $3\frac{1}{4}$% of 2000 lb. = 65 lb., the former yield of butter fat;
4% of 2200 lb. = 88 lb., the latter yield;
88 lb. − 65 lb. = 23 lb., the increase in amount;
23 × 26¢ = $5.98, the value of the increase; then,
$5.98 − $2.50 = $3.48, the sum gained per day.

92. 320,000 × 15¢ = $48,000, the value of the cheese;
28,000 × 25¢ = $7000, the value of the butter;
Hence, the value of the output = $48,000 + $7000 = $55,000.

93. The amount of cheese produced = 600 × 40 lb. = 24,000 lb.;
The amount of milk for 1 lb. of cheese = 237,600 lb. ÷ 24,000 = 9.9 lb.;
The amount of whey = 237,600 lb. − 24,000 lb. = 213,600 lb.

94. 24,000 lb. of cheese [Ex. 93] brought 24,000 × $13\frac{1}{4}$¢ = $3180;
The total expenses = $580 + $238.85 = $818.85;
Hence, the net proceeds = $3180 − $818.85 = $2361.15.

95. $2361.15 ÷ 8910 = $.$26\frac{1}{2}$, the amount paid per pound.

96. His share = 308 × $26\frac{1}{2}$¢ = $81.62.
308 lb. ÷ 8400 lb. = .$03\frac{2}{3}$; that is, $3\frac{2}{3}$% of the milk was butter fat.

Page 275

97. The sum paid per lamp = $47,302.75 ÷ 382 = $123.829+, or $123.83.

98. The cost was less by $47,302.75 − $35,162.96, or $12,139.79.

99. The cost of each new light = $35,162.96 ÷ 822 = $42.777+, or $42.78;
Hence, the cost per light was less by $123.83 − $42.78, or $81.05.

100. There were 822 − 382, or 440, more lights;
440 ÷ 382 = 1.1518+; that is, 440 is 115.2% of 382;
Hence, the city was 115.2% better lighted.

101. 212° − 40° = 172°, the difference in temperature; then,
It would be 212° F. at a depth of 172 × 50 ft. = 8600 ft.

102. 2500° − 40° = 2460°, the difference in temperature; hence,
It would be 2500° F. at a depth of 2460 × 50 ft. = 123,000 ft.

103. 5400° − 40° = 5360°, the difference in temperature; hence,
It would be 5400° F. at a depth of 5360 × 50 ft. = 268,000 ft.

104. The charge per mile = 12 × 1¢ = 12¢;
The rent for 458 mi. = 458 × 12¢ = $54.96.

105. The cost of the lease = 5 × $2800 = $14,000;
His total expenses = $14,000 + $1425 + $494 = $15,919;
The monthly rental = $40 + $35 + $33 + $30 + $28 + $25 + $22 + $20 + $18 + $15 + $14 + $12 = $292;
The rent for 5 yr., or 60 mo. = 60 × $292 = $17,520;
$17,520 − $536 = $16,984, the amount he received;
Hence, he gained $16,984 − $15,919 = $1065.

106. $492 ÷ 12 = $41, the rent he paid per month.
$41 − $35 = $6, his loss per month.

Page 276

107. 4 × $4.50 = $18, the rent per month;
10 × $18 = $180, the rent per year.

108. 12 × $10 = $120, the cost of the room per year; the cost of board for 365 da., or $52\frac{1}{7}$ wk. = $52\frac{1}{7}$ × $4.20 = $219; hence, room and board cost me $120 + $219 = $339.

109. He kept the typewriter 29 da. in June, 31 da. in July, 31 da. in Aug., 30 da. in Sept., and 26 da. in Oct. = 147 da., or 21 wk.;
21 × $1.25 = $26.25, the amount he paid.

110. If he gave $\frac{2}{5}$ of each crop, he had $\frac{3}{5}$ left;
$\frac{3}{5}$ of 1800 bu. = 1080 bu., the quantity of oats left;
$\frac{3}{5}$ of 2350 bu. = 1410 bu., the quantity of wheat left;
$\frac{3}{5}$ of 4280 bu. = 2568 bu., the quantity of corn left.

111. 220 × $5.25 = $1155, the total rent;
$\frac{1}{2}$ of $1155 = $577.50, the amount of each payment.

112. 30,000 lb. = 15 T.; 15 T. + 30 T. = 45 T., the whole weight; 30 T. is $\frac{30}{45}$, or $\frac{2}{3}$, of 45 T.; hence, the load is $\frac{2}{3}$, or $66\frac{2}{3}$%, of the weight.

113. 34,000 lb. = 17 T.; 17 T. + 50 T. = 67 T., the whole weight; 50 T. ÷ 67 T. = .7462+; hence, the paying load is 74.6% of the whole weight.

114. Such a vessel earns 9000 × 60¢ = $5400.

115. 9000 × $4.25 = $38,250, the value.

116. $\frac{1}{10}$ of 450 T. = 45 T., the quantity consumed per day;
45 × $2.50 = $112.50, the cost.

117. 1125 T. ÷ 25 = 45 T., the amount each shoveled;
45 × 14¢ = $6.30, the daily earnings of each man.

Page 277

118. 4 hr. 43 min. = 283 min.; 5300 T. ÷ 283 = 18.728^- T., or 18.7 T., the quantity unloaded per minute.
60 × 18.728 T. = 1123.68 T., or 1123.7 T., the quantity per hour.

119. 6000 × 14¢ = $840, the cost by hand;
6000 × 1.4¢ = $84, the cost by machinery.

120. Since 4 T. are loaded each time the 4 buckets make a round trip, the number of round trips = 2200 T. ÷ 4 T. = 550; 550 round trips take 550 × 50 sec., or 27,500 sec. = 7 hr. 38 min. 20 sec.

121. The number of train loads = 646,063 T. ÷ 1776 T., or 363 train loads and 1375 T. over.

122. The number of cars = 1776 T. ÷ 48 T., or 37 cars.

123. Its regular carrying capacity = 50 T. = 100,000 lb.; 48 long tons = 48 × 2240 lb. = 107,520 lb.; 107,520 lb. – 100,000 lb. = 7520 lb., the weight beyond its regular carrying capacity.

124. The time = 6 da. = 6 × 8 hr., or 48 hr. = 48 × 60 min., or 2880 min.;
The number of bucketfuls = 2880 × 2, or 5760 bucketfuls;
The weight of ore unloaded = 5760 × 10 T. = 57,600 T.; then,
The quantity of ore = 57,600 × 17 cu. ft. = 979,200 cu. ft.

125. 12 × 50 T. = 600 T., the quantity transferred in 45 min., or $\frac{3}{4}$ hr.;
Then, the quantity transferred per hour = 600 T. ÷ $\frac{3}{4}$ = 800 T.

KEY

TO

THIRD BOOK

Page 28

1. *Dr.* GEORGE GRIFFIN *Cr.*

190-					190-				
Jan.	8	Groceries	$10	37	Jan.	16	Cash	$ 5	
"	22	"	18	91	Feb.	15	"	14	50
Feb.	10	"	7	89	Mar.	8	Labor	6	30
"	24	"		48	"	14	Cash	17	
Mar.	6	"	15	75	Apr.	15	"	20	
"	20	"		66	May	3	Labor	8	75
Apr.	4	"	9	72	"	17	Cash	5	
"	23	"	13	96			Balance	1	19
			77	74				77	74
		Balance	1	19					

2. *Dr.* THOMAS HINDS & CO. *Cr.*

190-					190-				
July	12	Mdse.	$185	50	July	3	Mdse.	$237	45
"	19	Cash	210		"	10	"	149	80
"	25	Mdse.	119	63	"	28	Cash	125	
"	30	"	223	29	Aug.	6	Mdse.	92	24
Aug.	11	"	88	72	"	14	"	422	18
"	18	Cash	335		"	29	"	116	40
Sept.	10	Mdse.	47	54	Sept.	4	Cash	25	
		Balance	407	46	"	8	Mdse.	173	91
					"	24	"	275	16
			1617	14				1617	14
							Balance	407	46

3. *Dr.* JOHNSON & MASON *Cr.*

190–					190–				
May	6	7 Carriages	$875		Jan.	4	White Ash Lumber	$449	25
"	14	5 Double Wagons	450		"	9	Hub Timber (elm)	375	40
"	20	4 Runabouts	210		Feb.	4	Spoke Timber		
"	25	3 Surreys	525				(hickory)	274	65
June	1	3 Single Wagons	225		Apr.	8	Basswood Lumber	124	80
"	8	1 Phaëton	200		May	10	Cash	400	
"	"	6 Open Buggies	480		"	18	"	325	
"	15	2 Buckboards	100		June	4	"	560	
"	"	2 Road Carts	70		"	12	"	350	
							Balance	275	90
			3135					3135	
		Balance	275	90					

Page 48

1. $5 \times 10 - 7 = 50 - 7 = 43.$

2. $5 \times (10 - 7) = 5 \times 3 = 15.$

3. $2 \times .5 + .3 \times .4 = 1 + .3 \times .4 = 1 + .12 = 1.12.$

4. $16 - 2 \times 2 \times 12 \div 4 = 16 - 4 \times 12 \div 4 = 16 - 48 \div 4 = 16 - 12 = 4.$

5. $(2.5 - 1.3) \div 4 \times 2 = 1.2 \div 4 \times 2 = .3 \times 2 = .6.$

6. $6 + 2 \times 8 - 4 \div 2 = 6 + 16 - 4 \div 2 = 6 + 16 - 2 = 20.$

7. $(6 + 2) \times 8 - 4 \div 2 = 8 \times 8 - 4 \div 2 = 64 - 4 \div 2 = 64 - 2 = 62.$

8. $(6 + 2 \times 8 - 4) \div 2 = (6 + 16 - 4) \div 2 = 18 \div 2 = 9.$

9. $6 + 2 \times (8 - 4) \div 2 = 6 + 2 \times 4 \div 2 = 6 + 8 \div 2 = 6 + 4 = 10.$

10. $6 + 2 \times (8 - 4 \div 2) = 6 + 2 \times (8 - 2) = 6 + 2 \times 6 = 6 + 12 = 18.$

11. $3 + [2 + \overline{10 - 8} + \overline{4 \times 3 - 2 \times 5}] \div 2 = 3 + [2 + 2 + \overline{12 - 10}] \div 2 = 3 + [2 + 2 + 2] \div 2 = 3 + 6 \div 2 = 3 + 3 = 6.$

12. $24 - \{16 - 6 \div 3 \times (5 \times 5 - 6 \times 4)\} = 24 - \{16 - 6 \div 3 \times (25 - 24)\} = 24 - \{16 - 6 \div 3 \times 1\} = 24 - \{16 - 2\} = 24 - 14 = 10.$

Page 49

1. The distance traveled = 2 × 440 mi. = 880 mi.;
   The fare both ways = 880 × 2¢ = $17.60.

2. From 8:30 A.M. to 12:00 M. is 3 hr. 30 min.;
   3 hr. 30 min. + 4 hr. 45 min. = 8 hr. 15 min., the time going.
   From 1:00 P.M. to 10:00 P.M. is 9 hr., the time returning.

3. Since the time of returning was 9 hr., the average speed per hour *returning* was 440 mi. ÷ 9 = $48\frac{8}{9}$ mi.

4. The total number that got on = 320 + 69 + 46 + 48 + 21 = 504; the total number that got off before reaching Buffalo = 75 + 32 + 40 + 55 = 202; then, the number that went to Buffalo = 504 − 202 = 302.

5. From data in Ex. 4 and time-table: N.Y. to Albany = 143 mi.; 320 passengers traveled 320 × 143 mi. = 45,760 mi.; Albany to Utica = 238 mi. − 143 mi. = 95 mi.; leaving Albany, there were 75 − 69, or 6, passengers less; 320 − 6 = 314; 314 passengers traveled 314 × 95 mi. = 29,830 mi.; Utica to Syracuse = 291 mi. − 238 mi. = 53 mi.; leaving Utica, there were 46 − 32, or 14, passengers more; 314 + 14 = 328; 328 passengers traveled 328 × 53 mi. = 17,384 mi.; Syracuse to Rochester = 371 mi. − 291 mi. = 80 mi.; leaving Syracuse, there were 48 − 40, or 8, passengers more; 328 + 8 = 336; 336 passengers traveled 336 × 80 mi. = 26,880 mi.; Rochester to Buffalo = 440 mi. − 371 mi. = 69 mi.; leaving Rochester, there were 55 − 21, or 34, passengers less; 336 − 34 = 302; 302 passengers traveled 302 × 69 mi. = 20,838 mi.; hence the total mileage = 45,760 mi. + 29,830 mi. + 17,384 mi. + 26,880 mi. + 20,838 mi. = 140,692 mi.; the mileage fares = 140,692 × 2¢ = $2813.84; 133 purchasers of regular tickets in N.Y. paid, in addition, 133 × $.24 = $31.92; then, the total receipts from fares = $2813.84 + $31.92 = $2845.76.

6. 21 seats cost 21 × $1 = $21; 17 seats cost 17 × $1.50 = $25.50; 38 seats cost 38 × $2 = $76; 2 drawing-rooms cost 2 × $7 = $14; rent for 440 mi. = 440 × 1¢ = $4.40; hence, the total parlor car receipts = $21 + $25.50 + $76 + $14 + $4.40 = $140.90.

7. 440 × $.035 = $15.40, the pay of the engineers.

Page 50

8. The round trip takes 140 hr. + 160 hr. + 60 hr. = 360 hr.;
The number of days = 360 ÷ 24, or 15 days.

9. 1 round trip = 2 × 1266 mi. = 2532 mi.;
13 round trips = 13 × 2532 mi. = 32,916 mi.

10. 75,000 bu. of wheat weigh 75,000 × 60 lb. = 4,500,000 lb.;
The number of tons = 4,500,000 ÷ 2000, or 2250 T.;
On the down trip the vessel carries 2250 T. − 1125 T., or 1125 T., more.

11. The earnings on a down trip = 75,000 × 5¢ = $3750;
The earnings on an up trip = 1125 × $1 = $1125;
The earnings on a round trip = $3750 + $1125 = $4875;
The earnings for a season = 13 × $4875 = $63,375.

12. From solution of Ex. 11, the vessel earns $3750 − $1125, or $2625, more each time, going down.

During the whole season she earns 13 × $2625, or $34,125, more.

13. Coal on 1 round trip cost 230 × $3 = $690 ; on 13 round trips, 13 × $690 = $8970 ; elevating cost 975,000 × ¼¢ = $2437.50 ; shoveling cost 975,000 × $4 = $3900 ; hence, the total expenses = $7350 + $8970 + $500 + $2437.50 + $3900 + $1950 + $500 + $2875 + $4600 + $2000 + $2000 + $5750 = $42,832.50.

Page 51

14. $63,375, the total earnings (Ans. to Ex. 11), less $42,832.50, the total expenses (Ans. to Ex. 13) = $20,542.50, the total profit.

$20,542.50 ÷ 13 = $1580.19+, the profit for 1 round trip.

15. The total length of canals = 8.5 mi. + 14 mi. + 11 mi. + 1 mi. + 3.5 mi. + 7.125 mi. + 5.167 mi. + 26.75 mi. = 77.042 mi.

16. The average lift = 326.75 mi. ÷ 27 = 12.10185+ ft.

17. 136,000 lb. = 1360 cwt. ; the freight charges = 1360 × 30¢ = $408.

18. 45,000 lb. = 450 cwt. ; the cost = 450 × 74¢ = $333.

19. 8000 bu. weigh 8000 × 56 lb. = 448,000 lb. = 4480 cwt. ;
The entire cost per cwt. = 12¢ + 3½¢ = 15½¢ ;
The total freight charges = 4480 × $.15½ = $694.40.

20. 212,450 lb. = 2124.5 cwt. ; the freight on corn = 2124.5 × 12¢ = $254.94 ; 189,700 lb. = 1897 cwt. ; the freight on wheat = 1897 × 11¢ = $208.67 ; the number of cars = 5 + 3, or 8 cars ; switching cost 8 × $3 = $24 ; hence, the total freight charges = $254.94 + $208.67 + $24 = $487.61.

21. The coffee weighs 700 × 130 lb. = 91,000 lb. = 910 cwt. ;
The freight to Chicago = 910 × 25¢ = $227.50.
The freight to Omaha = 910 × 35¢ = $318.50.
The freight to Denver = 910 × 75¢ = $682.50.
The freight to Memphis = 910 × 14¢ = $127.40.
The freight to Salt Lake City = 910 × $1.50 = $1365.

Page 52

22. Adding the columns in the text, we find the shipments from Miss. = 1,302,420 bales ; 1,302,420 bales − 76,942 bales = 1,225,478 bales, the shipments grown in Miss. ; 1,225,478 bales + 21,650 bales = 1,247,128 bales, the total number produced in the state.

23. The difference = 228,619 bales − 15,458 bales = 213,161 bales.

24. The shipments to New Orleans and Memphis = 527,598 bales + 284,655 bales = 812,253 bales; 1,302,420 bales, the total shipments [solution, Ex. 3], less 812,253 bales = 490,167 bales, the shipments to other places; hence, 812,253 bales – 490,167 bales, or 322,086 bales, more were shipped to New Orleans and Memphis.

25. 6 × 4806 bales = 28,836 bales; 29,345 bales – 28,836 bales = 509 bales.

26. 22,100 cu. ft. – 15,200 cu. ft. = 6900 cu. ft., the gas used, 1st quarter;
6900 ÷ 1000 = 6.9; 6.9 × $1.20 = $8.28, the cost, 1st quarter.
29,900 cu. ft. – 22,100 cu. ft. = 7800 cu. ft., the gas used, 2d quarter;
7800 ÷ 1000 = 7.8; 7.8 × $1.20 = $9.36, the cost, 2d quarter.
34,300 cu. ft. – 29,900 cu. ft. = 4400 cu. ft., the gas used, 3d quarter;
4400 ÷ 1000 = 4.4; 4.4 × $1.20 = $5.28, the cost, 3d quarter.
39,600 cu. ft. – 34,300 cu. ft. = 5300 cu. ft., the gas used, 4th quarter;
5300 ÷ 1000 = 5.3; 5.3 × $1.20 = $6.36, the cost, 4th quarter.
The cost for the year = $8.28 + $9.36 + $5.28 + $6.36 = $29.28.

27. The cost for the year = $29.28 [Ans. to Ex. 27];
$29.28 ÷ 12 = $2.44, the average cost per month.

Page 53

28. 80.372 – 38.962, or 41.41, million greater than France.
80.372 – 41.961, or 38.411, million greater than Great Britain.
80.372 – 45.862, or 34.51, million greater than Japan.
80.372 – 58.549, or 21.823, million greater than Germany.
141.000 – 80.372, or 60.628, million less than Russia.

29. The combined population of France, G. B., and Japan = 38.962 + 41.961 + 45.862, or 126.785 million; the population of Russia exceeds this by 141.000 – 126.785, or 14.215, million.

30. 3,525,000 × $3.06 = $10,786,500, the value.

31. In Paris, the cost of butter = 5 × 50¢ = $2.50; the cost of milk = 6 × 10¢ = 60¢; the cost of beef = 8 × 40¢ = $3.20; the cost of sugar = 12 × 10¢ = $1.20; the cost of tea = 1.75 × $1.40 = $2.45.

32. The number of foreigners = .32 × 260,000 = 83,200.

33. The number of sacks = 7 × 625, or 4375 sacks;
The number of pounds = 4375 × 280, or 1,225,000 lb.;
The number of barrels = 1,225,000 lb. ÷ 196 lb., or 6250 bbl.

34. 9,450,000 × $.498 = $4,706,100, the value.

35. The number of our German immigrants = .93 × 28,000 = 26,040.

Page 54

36. $\$9708 \div 240 = \$40.45$, the price per person.

37. $3.4 \times \$4{,}500{,}000 = \$15{,}300{,}000$, the total value.

38. 6×10 hr. $= 60$ hr.; $60 \times \$.035 = \$2.10$, their earnings.

39. $\$580{,}322{,}098 - \$191{,}219{,}295 = \$389{,}102{,}803$, balance paid to U.S.

40. The number of visitors $= 26{,}569 + 9618 + 35{,}114 + 68{,}513 + 14{,}177 + 23{,}094$, or 177,085 visitors.

41. The average value per pound $= \$5{,}100{,}000 \div 15{,}000{,}000 = \$.34$;
The number of pounds to G.B. $= \$2{,}125{,}000 \div \$.34$, or, 6,250,000 lb.;
The number of pounds to U.S. $= \$578{,}000 \div \$.34$, or 1,700,000 lb.

42. $388{,}500{,}000 \times \$.64 = \$248{,}640{,}000$, the value.

43. The average yield per acre $= 222{,}200{,}000$ lb. $\div 524{,}500 = 423.64^{+}$ lb., or 423.6 lb.

44. The number of ostriches $= 48 \times 5$, or 240 ostriches;
The income $= 240 \times \$28.75 = \$6900$.

45. The total length $= 270{,}386$ mi. $+ 187{,}776$ mi. $+ 46{,}592$ mi. $+ 15{,}649$ mi. $+ 16{,}702$ mi. $= 537{,}105$ mi.

Page 60

20. The cost $= \frac{7500 \times \$8.40}{1000} = \$63$.

21. He earned per day $\frac{24 \times \$.56}{12} = \$1.12$.

22. $\frac{16 \times 40¢}{32¢} = 20$, the number of dozen.

23. $\frac{14{,}400 \times \$20}{1000 \times \$6} = 48$, the number of barrels.

24. The value per bushel $= \frac{4 \times 14 \times \$.90}{84} = \$.60$.

Page 68

32. $\frac{1}{4} = .25$; hence, $62\frac{1}{4} = 62.25$.

33. $3.4\frac{1}{2} = 3.4$ and $\frac{1}{2}$ of $.1$; $\frac{1}{2}$ of $.1 = .05$; hence $3.4\frac{1}{2} = 3.45$.

34. $.85\frac{7}{11} = .85$ and $\frac{7}{11}$ of $.01$; $\frac{7}{11}$ of $.01 = .006364^{-}$; hence, $.85\frac{7}{11} = .856364^{-}$.

35. $.00\frac{5}{16} = .00$ and $\frac{5}{16}$ of $.01$; $\frac{5}{16}$ of $.01 = .003125$; hence, $.00\frac{5}{16} = .003125$.

36. $.084\frac{1}{8} = .084$ and $\frac{1}{8}$ of $.001$; $\frac{1}{8}$ of $.001 = .000125$; hence, $.084\frac{1}{8} = .084125$.

37. $.046\frac{1}{4} = .046$ and $\frac{1}{4}$ of $.001$; $\frac{1}{4}$ of $.001 = .00025$; hence, $.046\frac{1}{4} = .04625$.

38. $.176\frac{3}{4} = .176$ and $\frac{3}{4}$ of $.001$; $\frac{3}{4}$ of $.001 = .00075$; hence, $.176\frac{3}{4} = .17675$.

Page 92

21. $\frac{4}{5} \times \frac{7}{8} \div \frac{14}{15} \times 2\frac{1}{4} = \frac{4}{5} \times \frac{7}{8} \times \frac{15}{14} \times \frac{9}{4} = \frac{27}{16} = 1\frac{11}{16}$.

22. $\frac{5}{8} \times 18 \div \frac{3}{4} \div 15 = \frac{5}{8} \times \frac{18}{1} \times \frac{4}{3} \times \frac{1}{15} = \frac{1}{1} = 1$.

23. $\frac{5}{6} \div 2\frac{2}{3} \times 14 \div \frac{5}{9} = \frac{5}{6} \times \frac{3}{8} \times \frac{14}{1} \times \frac{9}{5} = \frac{63}{8} = 7\frac{7}{8}$.

24. $\frac{4}{5} \div \frac{3}{10} \div 1\frac{3}{5} \times 3\frac{1}{2} = \frac{4}{5} \times \frac{10}{3} \times \frac{5}{8} \times \frac{7}{2} = \frac{35}{6} = 5\frac{5}{6}$.

25. $\frac{2}{3} \times 2\frac{5}{8} \div 1\frac{1}{6} \div 1\frac{11}{16} = \frac{2}{3} \times \frac{21}{8} \times \frac{6}{7} \times \frac{16}{27} = \frac{8}{9}$.

26. $1\frac{3}{4} \div 6\frac{1}{2} \times 9 \times \frac{39}{5} \div \frac{7}{12} = \frac{7}{4} \times \frac{2}{13} \times \frac{9}{1} \times \frac{39}{5} \times \frac{12}{7} = \frac{162}{5} = 32\frac{2}{5}$.

27. $42 \div \frac{2}{3} \times 2\frac{4}{5} \div 7 \div \frac{15}{16} = \frac{42}{1} \times \frac{3}{2} \times \frac{14}{5} \times \frac{1}{7} \times \frac{16}{15} = \frac{672}{25} = 26\frac{22}{25}$.

28. $\frac{24}{25} \div 16 \div \frac{8}{15} \times 1\frac{5}{6} \times 80 = \frac{24}{25} \times \frac{1}{16} \times \frac{15}{8} \times \frac{11}{6} \times \frac{80}{1} = \frac{33}{2} = 16\frac{1}{2}$.

29. $12 \times 2\frac{2}{3} \div 3\frac{3}{5} \times \frac{5}{14} \times 2\frac{1}{10} = \frac{12}{1} \times \frac{8}{3} \times \frac{5}{18} \times \frac{5}{14} \times \frac{21}{10} = \frac{20}{3} = 6\frac{2}{3}$.

30. $16 \div \frac{4}{15} \div 2\frac{2}{9} \times 1\frac{1}{5} \div 1\frac{4}{5} = \frac{16}{1} \times \frac{15}{4} \times \frac{9}{20} \times \frac{6}{5} \times \frac{5}{9} = \frac{18}{1} = 18$.

Page 93

31. $\frac{2}{3}$ of $6 \div \frac{3}{4}$ of $8 = \frac{2}{3} \times \frac{6}{1} \times \frac{4}{3} \times \frac{1}{8} = \frac{2}{3}$;
$\frac{2}{3} \times 6 \div \frac{3}{4} \times 8 = \frac{2}{3} \times \frac{6}{1} \times \frac{4}{3} \times \frac{8}{1} = \frac{128}{3} = 42\frac{2}{3}$.

32. $\frac{4}{5}$ of $20 \div \frac{5}{6}$ of $30 \times \frac{7}{8}$ of $40 = \frac{4}{5} \times \frac{20}{1} \times \frac{6}{5} \times \frac{1}{30} \times \frac{7}{8} \times \frac{40}{1} = \frac{112}{5} = 22\frac{2}{5}$.

33. $\frac{2}{3}$ of $14 \times \frac{3}{4}$ of $18 \div \frac{1}{6}$ of $42 = \frac{2}{3} \times \frac{14}{1} \times \frac{3}{4} \times \frac{18}{1} \times \frac{6}{1} \times \frac{1}{42} = \frac{18}{1} = 18$.

34. $\frac{5}{12}$ of $\frac{4}{5}$ of $\frac{7}{8} \div \frac{1}{2}$ of $\frac{14}{15}$ of $2\frac{1}{4} = \frac{5}{12} \times \frac{4}{5} \times \frac{7}{8} \times \frac{2}{1} \times \frac{15}{14} \times \frac{4}{9} = \frac{5}{18}$.

35. $\frac{8}{15}$ of $\frac{5}{16}$ of $\frac{11}{12}$ of $7 \div \frac{2}{3}$ of $\frac{3}{4}$ of $11 = \frac{8}{15} \times \frac{5}{16} \times \frac{11}{12} \times \frac{7}{1} \times \frac{3}{2} \times \frac{4}{3} \times \frac{1}{11} = \frac{7}{36}$.

36. $2\frac{1}{4} \times \frac{4}{5} \times 8\frac{5}{8} \times 9\frac{7}{12} \div (9 \times 3\frac{5}{6} \times 6\frac{3}{4} \times \frac{2}{3}) = \frac{9}{4} \times \frac{4}{5} \times \frac{69}{8} \times \frac{115}{12} \times \frac{1}{9} \times \frac{6}{23} \times \frac{4}{27} \times \frac{3}{2} = \frac{23}{24}$.

37. $6\frac{3}{8} \times 15 \times \frac{9}{10} \times 4\frac{2}{3} \div (1\frac{1}{16} \times 5\frac{1}{4} \times \frac{5}{8} \times 21\frac{1}{3}) = \frac{51}{8} \times \frac{15}{1} \times \frac{9}{10} \times \frac{14}{3} \times \frac{16}{17} \times \frac{4}{21} \times \frac{8}{5} \times \frac{3}{64} = \frac{27}{5} = 5\frac{2}{5}$.

38. $\frac{15}{16} \div 2\frac{5}{8} \times \frac{2}{5} \div \frac{19}{20} \div \frac{7}{8} \times 12\frac{2}{3} \div 3\frac{1}{5} \times 4\frac{1}{12} \times 2 = \frac{15}{16} \times \frac{8}{21} \times \frac{2}{5} \times \frac{20}{19} \times \frac{8}{7} \times \frac{38}{3} \times \frac{5}{16} \times \frac{49}{12} \times \frac{2}{1} = \frac{50}{9} = 5\frac{5}{9}$.

39. $\frac{16}{25} \div 13\frac{1}{2} \times \frac{9}{16} \times 9\frac{1}{6} \div \frac{27}{48} \div 1\frac{1}{10} \times 26\frac{1}{4} \times \frac{5}{8} \div \frac{45}{72} \times \frac{9}{10} = \frac{16}{25} \times \frac{2}{27} \times \frac{9}{16} \times \frac{55}{6} \times \frac{48}{27} \times \frac{10}{11} \times \frac{105}{4} \times \frac{5}{8} \times \frac{72}{45} \times \frac{9}{10} = \frac{28}{3} = 9\frac{1}{3}$.

40. $\frac{11}{12} \times \frac{3}{14} \div 6\frac{3}{5} \times \frac{18}{25} \times 8\frac{3}{4} \div \frac{26}{36} \div 12\frac{5}{6} \times \frac{13}{15} \times 7\frac{1}{3} \div \frac{3}{25} \times 1\frac{2}{5} = \frac{11}{12} \times \frac{3}{14} \times \frac{5}{33} \times \frac{18}{25} \times \frac{35}{4} \times \frac{36}{26} \times \frac{6}{77} \times \frac{13}{15} \times \frac{22}{3} \times \frac{25}{3} \times \frac{7}{5} = \frac{3}{2} = 1\frac{1}{2}$.

Page 94

2. $\dfrac{\frac{3}{8}}{\frac{9}{10}} = \frac{3}{8} \div \frac{9}{10} = \frac{3}{8} \times \frac{10}{9} = \frac{5}{12}$.

3. $\dfrac{\frac{5}{8}}{\frac{5}{12}} = \frac{5}{8} \div \frac{5}{12} = \frac{5}{8} \times \frac{12}{5} = \frac{3}{2} = 1\frac{1}{2}$.

4. $\dfrac{\frac{5}{6}}{\frac{15}{16}} = \frac{5}{6} \div \frac{15}{16} = \frac{5}{6} \times \frac{16}{15} = \frac{8}{9}$.

5. $\dfrac{\frac{7}{8}}{\frac{7}{24}} = \frac{7}{8} \div \frac{7}{24} = \frac{7}{8} \times \frac{24}{7} = 3$.

6. $\dfrac{\frac{14}{15}}{\frac{21}{25}} = \frac{14}{15} \div \frac{21}{25} = \frac{14}{15} \times \frac{25}{21} = \frac{10}{9} = 1\frac{1}{9}$.

7. $\dfrac{12}{\frac{5}{6}} = 12 \div \frac{5}{6} = \frac{12}{1} \times \frac{6}{5} = \frac{72}{5} = 14\frac{2}{5}$.

8. $\dfrac{\frac{24}{25}}{8} = \frac{24}{25} \div 8 = \frac{24}{25} \times \frac{1}{8} = \frac{3}{25}$.

9. $\dfrac{4\frac{7}{8}}{\frac{5}{6}} = \frac{39}{8} \div \frac{5}{6} = \frac{39}{8} \times \frac{6}{5} = \frac{117}{20} = 5\frac{17}{20}$.

10. $\dfrac{6\frac{3}{5}}{\frac{3}{4}} = \frac{33}{5} \div \frac{3}{4} = \frac{33}{5} \times \frac{4}{3} = \frac{44}{5} = 8\frac{4}{5}$.

11. $\dfrac{4\frac{1}{6}}{4\frac{2}{3}} = \frac{25}{6} \div \frac{14}{3} = \frac{25}{6} \times \frac{3}{14} = \frac{25}{28}$.

12. $\dfrac{33\frac{1}{3}}{100} = \frac{100}{3} \div 100 = \frac{100}{3} \times \frac{1}{100} = \frac{1}{3}$.

13. $\dfrac{87\frac{1}{2}}{100} = \frac{175}{2} \div 100 = \frac{175}{2} \times \frac{1}{100} = \frac{7}{8}$.

14. $\dfrac{.6\frac{1}{4}}{3.7\frac{1}{2}} = \dfrac{6\frac{1}{4}}{37\frac{1}{2}} = \frac{25}{4} \div \frac{75}{2} = \frac{25}{4} \times \frac{2}{75} = \frac{1}{6}$.

15. $\dfrac{.62\frac{1}{2}}{.66\frac{2}{3}} = \dfrac{62\frac{1}{2}}{66\frac{2}{3}} = \frac{125}{2} \div \frac{200}{3} = \frac{125}{2} \times \frac{3}{200} = \frac{15}{16}$.

16. $\dfrac{4.3\frac{1}{4}}{25.9\frac{1}{2}} = \dfrac{43\frac{1}{4}}{259\frac{1}{2}} = \frac{173}{4} \div \frac{519}{2} = \frac{173}{4} \times \frac{2}{519} = \frac{1}{6}$.

17. $\dfrac{\frac{4}{5} \div \frac{2}{3}}{\frac{3}{4} \text{ of } 5\frac{1}{3}} = \frac{4}{5} \times \frac{3}{2}$ divided by $\frac{3}{4} \times \frac{16}{3} = \frac{4}{5} \times \frac{3}{2} \times \frac{4}{3} \times \frac{3}{16} = \frac{3}{10}$.

18. $\dfrac{\frac{2}{3} \text{ of } 4\frac{3}{8}}{4\frac{1}{3} + \frac{11}{12}} = \frac{2}{3} \times \frac{35}{8}$ divided by $4\frac{1}{3} + \frac{11}{12} = \frac{2}{3} \times \frac{35}{8} \div 5\frac{1}{4} = \frac{2}{3} \times \frac{35}{8} \times \frac{4}{21} = \frac{5}{9}$.

19. $\dfrac{4\frac{3}{8} - 2\frac{1}{2}}{2\frac{1}{4} + 1\frac{4}{5}} = 4\frac{3}{8} - 2\frac{1}{2}$ divided by $2\frac{1}{4} + 1\frac{4}{5} = 1\frac{7}{8} \div 4\frac{1}{20} = \frac{15}{8} \times \frac{20}{81} = \frac{25}{54}$.

20. $\dfrac{6\frac{2}{3} \div 3\frac{1}{8}}{\frac{4}{5} \div 3\frac{5}{6}} = \frac{20}{3} \times \frac{8}{25}$ divided by $\frac{4}{5} \times \frac{6}{23} = \frac{20}{3} \times \frac{8}{25} \times \frac{5}{4} \times \frac{23}{6} = \frac{92}{9} = 10\frac{2}{9}$.

21. $\dfrac{\frac{19}{4} \text{ of } 7\frac{7}{10}}{2\frac{3}{8} \times 1\frac{1}{6}} = \frac{19}{4} \times \frac{77}{10}$ divided by $\frac{19}{8} \times \frac{7}{6} = \frac{19}{4} \times \frac{77}{10} \times \frac{8}{19} \times \frac{6}{7} = \frac{66}{5} = 13\frac{1}{5}$.

Page 96

2. $\frac{1}{2} \div \frac{3}{4} = \frac{2}{3}$; hence, $\frac{1}{2}$ is $\frac{2}{3}$ of $\frac{3}{4}$.

3. $\frac{1}{4} \div \frac{5}{8} = \frac{2}{5}$; hence, $\frac{1}{4}$ is $\frac{2}{5}$ of $\frac{5}{8}$.

4. $\frac{1}{6} \div \frac{1}{3} = \frac{1}{2}$; hence, $\frac{1}{6}$ is $\frac{1}{2}$ of $\frac{1}{3}$.

5. $\frac{3}{4} \div \frac{4}{5} = \frac{15}{16}$; hence, $\frac{3}{4}$ is $\frac{15}{16}$ of $\frac{4}{5}$.

6. $\frac{9}{10} \div \frac{3}{8} = \frac{12}{5}$; hence, $\frac{9}{10}$ is $\frac{12}{5}$ of $\frac{3}{8}$.

7. $\frac{5}{16} \div \frac{3}{4} = \frac{5}{12}$; hence, $\frac{5}{16}$ is $\frac{5}{12}$ of $\frac{3}{4}$.

8. $\frac{1}{10} \div \frac{4}{15} = \frac{3}{8}$; hence, $\frac{1}{10}$ is $\frac{3}{8}$ of $\frac{4}{15}$.

9. $\frac{27}{40} \div \frac{18}{25} = \frac{15}{16}$; hence, $\frac{27}{40}$ is $\frac{15}{16}$ of $\frac{18}{25}$.

10. $5 \div 6\frac{1}{4} = \frac{4}{5}$; hence, 5 is $\frac{4}{5}$ of $6\frac{1}{4}$.

11. $4 \div 4\frac{4}{5} = \frac{5}{6}$; hence, 4 is $\frac{5}{6}$ of $4\frac{4}{5}$.

12. $7 \div 9\frac{1}{3} = \frac{3}{4}$; hence, 7 is $\frac{3}{4}$ of $9\frac{1}{3}$.

13. $2 \div 3\frac{1}{8} = \frac{16}{25}$; hence, 2 is $\frac{16}{25}$ of $3\frac{1}{8}$.

14. $3\frac{1}{3} \div 10 = \frac{1}{3}$; hence, $3\frac{1}{3}$ is $\frac{1}{3}$ of 10.

15. $6\frac{1}{2} \div 12 = \frac{13}{24}$; hence, $6\frac{1}{2}$ is $\frac{13}{24}$ of 12.

16. $4\frac{2}{3} \div 14 = \frac{1}{3}$; hence, $4\frac{2}{3}$ is $\frac{1}{3}$ of 14.

17. $\frac{4}{5} \div 8 = \frac{1}{10}$; hence, $\frac{4}{5}$ is $\frac{1}{10}$ of 8.

18. $\frac{3}{5} \div 12 = \frac{1}{20}$; hence, $\frac{3}{5}$ is $\frac{1}{20}$ of 12.

19. $6\frac{2}{3} \div 5 = \frac{4}{3}$; hence, $6\frac{2}{3}$ is $\frac{4}{3}$ of 5.

20. $2\frac{3}{5} \div 3\frac{1}{4} = \frac{4}{5}$; hence, $2\frac{3}{5}$ is $\frac{4}{5}$ of $3\frac{1}{4}$.

21. $6\frac{1}{2} \div 8\frac{2}{3} = \frac{3}{4}$; hence, $6\frac{1}{2}$ is $\frac{3}{4}$ of $8\frac{2}{3}$.

22. $4\frac{7}{8} \div 9\frac{3}{4} = \frac{1}{2}$; hence, $4\frac{7}{8}$ is $\frac{1}{2}$ of $9\frac{3}{4}$.

23. $\frac{1}{2} \div \frac{2}{3} = \frac{3}{4}$; hence, $\frac{1}{2}$ is $\frac{3}{4}$ of $\frac{2}{3}$; since a train $\frac{2}{3}$ mi. long contained 88 cars, a train $\frac{1}{2}$ mi. long would contain $\frac{3}{4}$ of 88 cars, or 66 cars.

24. $1\frac{2}{5} \div 2\frac{4}{5} = \frac{1}{2}$; hence, $1\frac{2}{5}$ is $\frac{1}{2}$ of $2\frac{4}{5}$; since the distance covered in $2\frac{4}{5}$ min. was 5 mi., the distance covered in $1\frac{2}{5}$ min. $= \frac{1}{2}$ of 5 mi., or $2\frac{1}{2}$ mi.

25. $\frac{3}{16} \div \frac{1}{2} = \frac{3}{8}$; hence, $\frac{3}{16}$ is $\frac{3}{8}$ of $\frac{1}{2}$; since a square foot $\frac{1}{2}$ in. thick weighs 20.141 lb., a square foot $\frac{3}{16}$ in. thick weighs $\frac{3}{8}$ of 20.141 lb., or 7.553^- lb.

26. $4\frac{1}{4} \div \frac{5}{6} = \frac{51}{10}$; hence, $4\frac{1}{4}$ is $\frac{51}{10}$ of $\frac{5}{6}$; since the machine makes 350 baskets in $\frac{5}{6}$ hr., in $4\frac{1}{4}$ hr. it makes $\frac{51}{10} \times 350$ baskets $= 1785$ baskets.

27. $270 \div 180 = \frac{3}{2}$; hence, 270 is $\frac{3}{2}$ of 180; since 180 lb. of fiber are yielded by 220 trees, 270 lb. would be yielded by $\frac{3}{2} \times 220$ trees $= 330$ trees.

28. $\frac{2}{5}$ min. $\div 6\frac{2}{3}$ min. $= \frac{3}{50}$; hence, $\frac{2}{5}$ min. is $\frac{3}{50}$ of $6\frac{2}{3}$ min.;
Therefore, the present time is $\frac{3}{50}$ of the original time.

Page 98

1. $\frac{2}{3}$ of the number $= 84$;
$\frac{1}{3}$ of the number $= \frac{1}{2}$ of $84 = 42$;
Then, the number $= 3 \times 42 = 126$.

2. $\frac{3}{4}$ of the number $= 91$;
$\frac{1}{4}$ of the number $= \frac{1}{3}$ of $91 = \frac{91}{3}$;
Then, the number $= 4 \times \frac{91}{3} = 121\frac{1}{3}$.

3. $\frac{4}{5}$ of the number $= 224$;
$\frac{1}{5}$ of the number $= \frac{1}{4}$ of $224 = 56$;
Then, the number $= 5 \times 56 = 280$.

4. $\frac{5}{6}$ of the number $= 375$;
$\frac{1}{6}$ of the number $= \frac{1}{5}$ of $375 = 75$;
Then, the number $= 6 \times 75 = 450$.

5. $\frac{9}{10}$ of the number $= 756$;
$\frac{1}{10}$ of the number $= \frac{1}{9}$ of $756 = 84$;
Then, the number $= 10 \times 84 = 840$.

6. $\frac{11}{12}$ of the number $= 924$;
$\frac{1}{12}$ of the number $= \frac{1}{11}$ of $924 = 84$;
Then, the number $= 12 \times 84 = 1008$.

7. $\frac{3}{4}$ of the number $= 2684$;
$\frac{1}{4}$ of the number $= \frac{1}{3}$ of $2684 = \frac{2684}{3}$;
Then, the number $= 4 \times \frac{2684}{3} = 3578\frac{2}{3}$.

8. $\frac{7}{8}$ of the number $= 4725$;
$\frac{1}{8}$ of the number $= \frac{1}{7}$ of $4725 = 675$;
Then, the number $= 8 \times 675 = 5400$.

10. $\frac{3}{4}$ of the number $= \frac{5}{8}$;
$\frac{1}{4}$ of the number $= \frac{1}{3}$ of $\frac{5}{8} = \frac{5}{24}$;
Then, the number $= 4 \times \frac{5}{24} = \frac{5}{6}$.

11. $\frac{2}{5}$ of the number $= \frac{2}{3}$;
$\frac{1}{5}$ of the number $= \frac{1}{2}$ of $\frac{2}{3} = \frac{1}{3}$;
Then, the number $= 5 \times \frac{1}{3} = 1\frac{2}{3}$.

12. $\frac{5}{6}$ of the number $= \frac{7}{12}$;
$\frac{1}{6}$ of the number $= \frac{1}{5}$ of $\frac{7}{12} = \frac{7}{60}$;
Then, the number $= 6 \times \frac{7}{60} = \frac{7}{10}$.

13. $\frac{3}{8}$ of the number $= \frac{9}{10}$;
$\frac{1}{8}$ of the number $= \frac{1}{3}$ of $\frac{9}{10} = \frac{3}{10}$;
Then, the number $= 8 \times \frac{3}{10} = 2\frac{2}{5}$.

14. $\frac{3}{10}$ of the number $= 3\frac{3}{5}$;
$\frac{1}{10}$ of the number $= \frac{1}{3}$ of $3\frac{3}{5} = \frac{6}{5}$;
Then, the number $= 10 \times \frac{6}{5} = 12$.

15. $\frac{5}{12}$ of the number $= 6\frac{5}{6}$;
$\frac{1}{12}$ of the number $= \frac{1}{5}$ of $6\frac{5}{6} = \frac{41}{30}$;
Then, the number $= 12 \times \frac{41}{30} = 16\frac{2}{5}$.

16. $\frac{11}{4}$ of the number $= 5\frac{1}{2}$;
$\frac{1}{4}$ of the number $= \frac{1}{11}$ of $5\frac{1}{2} = \frac{1}{2}$;
Then, the number $= 4 \times \frac{1}{2} = 2$.

17. $\frac{34}{5}$ of the number $= 4\frac{1}{4}$;
$\frac{1}{5}$ of the number $= \frac{1}{34}$ of $4\frac{1}{4} = \frac{1}{8}$;
Then, the number $= 5 \times \frac{1}{8} = \frac{5}{8}$.

18. $\frac{2}{3}$ of the length of canals = 1500 mi.;
$\frac{1}{3}$ of the length of canals = $\frac{1}{2}$ of 1500 mi. = 750 mi.;
Then, the length of canals = 3 × 750 mi. = 2250 mi.

19. $\frac{7}{16}$ of the cost = $17\frac{1}{2}$ million dollars;
$\frac{1}{16}$ of the cost = $\frac{1}{7}$ of $17\frac{1}{2}$, or $\frac{5}{2}$, million dollars;
Then, the cost = 16 × $\frac{5}{2}$, or 40, million dollars.

20. $\frac{1}{6}$ of the land = 150 A.;
Then, the land = 6 × 150 A. = 900 A.

21. $\frac{4}{5}$ of the cost of the German cruiser = \$675,000 − \$5000 = \$670,000;
$\frac{1}{5}$ of the cost of the German cruiser = $\frac{1}{4}$ of \$670,000 = \$167,500;
Then, the German cruiser cost 5 × \$167,500 = \$837,500.

22. $\frac{2}{11}$ of the length of the chain = 180 ft.;
$\frac{1}{11}$ of the length of the chain = $\frac{1}{2}$ of 180 ft. = 90 ft.;
Then, the length of the chain = 11 × 90 ft. = 990 ft.

23. $\frac{13}{30}$ of her capacity = 650 T.;
$\frac{1}{30}$ of her capacity = $\frac{1}{13}$ of 650 T. = 50 T.;
Then, her capacity = 30×50 T. = 1500 T.

24. $\frac{3}{14}$ of the weight pulled by the elephant = 1875 lb.;
$\frac{1}{14}$ of the weight pulled by the elephant = $\frac{1}{3}$ of 1875 lb. = 625 lb.
Then, the elephant pulled 14×625 lb. = 8750 lb.
The camel pulled $\frac{11}{15}$ of 1875 lb. = 1375 lb.

Page 101

26. Since $.125 = \frac{1}{8}$, $27 \times .125 = 27 \times \frac{1}{8} = 3.375$.

27. Since $12.5 = \frac{1}{8}$ of 100, $48 \times 12.5 = \frac{1}{8}$ of $4800 = 600$.

28. Since $750 = \frac{3}{4}$ of 1000, $71 \times 750 = \frac{3}{4}$ of $71,000 = 53,250$.

29. Since $37.5 = \frac{3}{8}$ of 100, $62 \times 37.5 = \frac{3}{8}$ of $6200 = 2325$.

30. Since $.625 = \frac{5}{8}$, $94 \times .625 = \frac{5}{8}$ of $94 = 58.75$.

31. Since $250 = \frac{1}{4}$ of 1000, $250 \times 67 = \frac{1}{4}$ of $67,000 = 16,750$.

32. Since $500 = \frac{1}{2}$ of 1000, $500 \times 99 = \frac{1}{2}$ of $99,000 = 49,500$.

33. Since $875 = \frac{7}{8}$ of 1000, $875 \times 48 = \frac{7}{8}$ of $48,000 = 42,000$.

34. Since $900 = \frac{9}{10}$ of 1000, $900 \times .81 = \frac{9}{10}$ of $810 = 729$.

35. Since $125 = \frac{1}{8}$ of 1000, $125 \times 3.9 = \frac{1}{8}$ of $3900 = 487.5$.

36. Since $25 = \frac{1}{4}$ of 100, $25 \times 44 \times 19 = \frac{1}{4}$ of $4400 \times 19 = 20,900$.

37. Since $50 = \frac{1}{2}$ of 100, $50 \times 24 \times 77 = \frac{1}{2}$ of $2400 \times 77 = 92,400$.

38. Since $75 = \frac{3}{4}$ of 100, $32 \times 75 \times 22 = 32 \times \frac{3}{4}$ of $2200 = 52,800$.

39. Since $75 = \frac{3}{4}$ of 100, $75 \times 71 \times 72 = \frac{3}{4}$ of $7100 \times 72 = 383,400$.

40. Since $1.25 = \frac{1}{8}$ of 10, $66 \times 16 \times 1.25 = \frac{1}{8}$ of $660 \times 16 = 1320$.

41. Since $\$.50 = \$\frac{1}{2}$, the number of articles for \$1 is 2.
The number of articles for \$5 = 5 × 2, or 10.
The number of articles for \$75 = 75 × 2, or 150.
The number of articles for \$250 = 250 × 2, or 500.
The number of articles for \$105 = 105 × 2, or 210.
The number of articles for \$225 = 225 × 2, or 450.

42. Since $25¢ = \$\frac{1}{4}$, the number of articles for \$1 is 4.
The number of articles for \$5 = 5 × 4, or 20.
The number of articles for \$75 = 75 × 4, or 300.
The number of articles for \$250 = 250 × 4, or 1000.
The number of articles for \$105 = 105 × 4, or 420.
The number of articles for \$225 = 225 × 4, or 900.

Since $12\frac{1}{2}$¢ $= \$\frac{1}{8}$, the number of articles for \$1 is 8.
The number of articles for \$5 $= 5 \times 8$, or 40.
The number of articles for \$75 $= 75 \times 8$, or 600.
The number of articles for \$250 $= 250 \times 8$, or 2000.
The number of articles for \$105 $= 105 \times 8$, or 840.
The number of articles for \$225 $= 225 \times 8$, or 1800.

Since 20¢ $= \$\frac{1}{5}$, the number of articles for \$1 is 5.
The number of articles for \$5 $= 5 \times 5$, or 25.
The number of articles for \$75 $= 75 \times 5$, or 375.
The number of articles for \$250 $= 250 \times 5$, or 1250.
The number of articles for \$105 $= 105 \times 5$, or 525.
The number of articles for \$225 $= 225 \times 5$, or 1125.

44. At \$1 per yard 120 yd. can be bought for \$120; but since $\$1 \div \$\frac{2}{3} = 1\frac{1}{2}$, at $\$\frac{2}{3}$ per yard $1\frac{1}{2}$ times as many yards can be bought; that is, $1\frac{1}{2} \times$ 120 yd., or 180 yd., can be bought for \$120.

45. At \$1 per yard 120 yd. can be bought for \$120; but since $\$1 \div \$\frac{3}{4} = 1\frac{1}{3}$, at $\$\frac{3}{4}$ per yard $1\frac{1}{3}$ times as many yards can be bought; that is, $1\frac{1}{3} \times$ 120 yd., or 160 yd., can be bought for \$120.

46. At \$1 per yard 120 yd. can be bought for \$120; but since $\$1 \div \$\frac{5}{6} = 1\frac{1}{5}$, at $\$\frac{5}{6}$ per yard $1\frac{1}{5}$ times as many yards can be bought; that is, $1\frac{1}{5} \times$ 120 yd., or 144 yd., can be bought for \$120.

47. At \$1 per yard 120 yd. can be bought for \$120; but since $\$1 \div \$1\frac{1}{4} = \frac{4}{5}$, at $\$1\frac{1}{4}$ per yard $\frac{4}{5}$ as many yards can be bought; that is, $\frac{4}{5}$ of 120 yd., or 96 yd., can be bought for \$120.

48. At \$1 per yard 120 yd. can be bought for \$120; but since $\$1 \div \$1\frac{1}{2} = \frac{2}{3}$, at $\$1\frac{1}{2}$ per yard $\frac{2}{3}$ as many yards can be bought; that is, $\frac{2}{3}$ of 120 yd., or 80 yd., can be bought for \$120.

49. At \$1 per yard 120 yd. can be bought for \$120; but since $\$1 \div \$2\frac{1}{2} = \frac{2}{5}$, at $\$2\frac{1}{2}$ per yard $\frac{2}{5}$ as many yards can be bought; that is, $\frac{2}{5}$ of 120 yd., or 48 yd., can be bought for \$120.

50. Since $.25 = \frac{1}{4}$, $47 \div .25 = 47 \div \frac{1}{4} = 47 \times 4 = 188$.

51. Since $2.5 = \frac{1}{4}$ of 10, $64 \div 2.5 = 64 \div \frac{10}{4} = 6.4 \times 4 = 25.6$.

52. Since $7.5 = \frac{3}{4}$ of 10, $48 \div 7.5 = 48 \div \frac{30}{4} = 4.8 \times \frac{4}{3} = 6.4$.

53. Since $37.5 = \frac{3}{8}$ of 100, $111 \div 37.5 = 111 \div \frac{300}{8} = 1.11 \times \frac{8}{3} = 2.96$.

54. Since $87.5 = \frac{7}{8}$ of 100, $34.3 \div 87.5 = 34.3 \div \frac{700}{8} = .343 \times \frac{8}{7} = .392$.

55. Since $500 = \frac{1}{2}$ of 1000, $316 \div 500 = 316 \div \frac{1000}{2} = .316 \times 2 = .632$.

56. Since $250 = \frac{1}{4}$ of 1000, $428 \div 250 = 428 \div \frac{1000}{4} = .428 \times 4 = 1.712$.

57. Since $625 = \frac{5}{8}$ of 1000, $715 \div 625 = 715 \div \frac{5000}{8} = .715 \times \frac{8}{5} = 1.144$.

58. Since 12.5 = $\frac{1}{8}$ of 100, 240 ÷ 12.5 = 240 ÷ $\frac{100}{8}$ = 2.40 × 8 = 19.2.

59. Since .125 = $\frac{1}{8}$, .425 ÷ .125 = .425 ÷ $\frac{1}{8}$ = .425 × 8 = 3.4.

60. 288 articles @ 50¢ cost 288 × \$$\frac{1}{2}$, or \$144.
288 articles @ 1¢ cost \$2.88; @ 51¢, \$144 + \$2.88, or \$146.88.
288 articles @ 49¢ cost \$144 − \$2.88, or \$141.12.

61. 432 articles @ 33$\frac{1}{3}$¢ cost 432 × \$$\frac{1}{3}$, or \$144.
432 articles @ $\frac{1}{3}$¢ cost \$1.44; @ 33¢, \$144 − \$1.44, or \$142.56.
432 articles @ $\frac{1}{2}$¢ cost \$2.16; @ 33$\frac{1}{2}$¢, \$142.56 + \$2.16, or \$144.72.

62. His gain per pound = 61¢ − 47$\frac{1}{2}$¢, or 13$\frac{1}{2}$¢ = 12$\frac{1}{2}$¢ + 1¢;
1024 × \$$\frac{1}{8}$ = \$128; 1024 × 1¢ = \$10.24; hence,
His total gain = \$128 + \$10.24 = \$138.24.

Page 102

1. The plantation contained 85.8 × 500 trees = 42,900 trees.

2. 42,900 × 1.6 lb. = 68,640 lb., the yield.

3. He received per pound \$4719 ÷ 68,640, or 6$\frac{7}{8}$¢.

4. \$4719 − \$2951.52 = \$1767.48, his gain.

5. From Ex. 4 the whole cost = \$2951.52; from Ex. 3 the number of pounds = 68,640; \$2951.52 ÷ 68,640 = 4$\frac{3}{10}$¢, the cost per pound.

He received 6$\frac{7}{8}$¢ per pound [Ans. to Ex. 3]; hence, his gain on each pound = 6$\frac{7}{8}$¢ − 4$\frac{3}{10}$¢ = 2$\frac{23}{40}$¢.

6. The total gain = \$1767.48 [Ans. to Ex. 4]; the number of acres = 85.8 [Ex. 1]; hence, the gain per acre = \$1767.48 ÷ 85.8 = \$20.60.

7. From Ex. 3, he paid \$4719 for the coffee; his total expenses = \$4719 + \$274.56 = \$4993.56; he received 68,640 × 7$\frac{1}{2}$¢ = \$5148; hence, his gain = \$5148 − \$4993.56 = \$154.44.

8. From Ex. 3, the weight of the coffee = 68,640 lb.; then, the number of bags required = 68,640 lb. ÷ 132 lb., or 520 bags.

9. 520 × \$.37$\frac{1}{2}$ = \$193.44, the freight charges.

10. From Ex. 3 the weight of the coffee = 68,640 lb.; .15 of 68,640 lb. = 10,296 lb., the weight lost; 68,640 lb. − 10,296 lb. = 58,344 lb., the weight, roasted.

Page 103

11. Each person in U.S. uses 11.75 lb. − .67 lb., or 11.08 lb., more than each person in G.B.; then, the city in U.S. uses 75,000 × 11.08 lb., or 831,000 lb. more than the city in G.B.

12. The number of plants per acre = 512,640 ÷ 240, or 2136 plants.

13. 4$\frac{1}{2}$ ft. ÷ 2$\frac{5}{6}$ ft. = 1$\frac{2}{3}$ ft., the height of each.

14. The woman picked per day 2 × 7¾ lb. = 15½ lb.;
In 6 days she picked 6 × 15½ lb. = 93 lb.;
Her earnings = 93 × ¾¢ = 69¾¢, or 70¢.

15. The average yield per acre = 2136 × 1⅛ lb. = 2403 lb.

16. From Ex. 15 each plant furnished 1⅛ lb. of green leaves; 1⅛÷4½=¼; that is, 1⅛ is ¼ of 4½; then, since 4½ lb. of green leaves made 1 lb. of marketable tea, 1⅛ lb. of green leaves made ¼ lb. of marketable tea.

17. Since [Ex. 16] 4½ lb. of green leaves make 1 lb. of marketable tea, the number of pounds of marketable tea per acre = 2403 ÷ 4½, or 534 lb.

From Ex. 12, the number of acres = 240; then, the quantity of marketable tea from the entire plantation = 240 × 534 lb. = 128,160 lb.

Page 104

18. The amount of space required = 1890 × 10 sq. ft. = 18,900 sq. ft.;
The number of trays = 18,900 sq. ft. ÷ 6 sq. ft., or 3150 trays.

19. The machine rolled in 9 hr. as much as a man rolled in 9 × 4⅓ days, or 39 days; hence, the machine rolled in 9 hr., 39 × 75 lb. = 2925 lb.

20. The number of chests = 128,160 lb. ÷ 40 lb., or 3204 chests.

21. ⅙ of 3204 chests = 534 chests, the amount of that grade;
534 chests ÷ 22¼ = 24 chests, the number packed per hour.

22. From Ex. 20 and 21, the quantity of tea of this grade = ⅙ of 128,160 lb. = 21,360 lb.; then, the price per pound = $2990.40 ÷ 21,360 = $.14.

23. The total amount = 53,157,000 lb. + 42,700,000 lb. + 7,679,000 lb. + 6,647,000 lb. + 2,723,000 lb. = 112,906,000 lb.

24. From data in Ex. 23, Great Britain received 155,196,000 lb. – 7,679,000 lb., or 147,517,000 lb., more from India, and 53,157,000 lb. – 11,048,000 lb., or 42,109,000 lb., less from China.

25. The average per person in G.B. = 301.5 lb. ÷ 50 = 6.03 lb.
The average per person in Russia = 47.5 lb. ÷ 50 = .95 lb.
The average per person in Germany = 6 lb. ÷ 50 = .12 lb.
The average per person in France = 3 lb. ÷ 50 = .06 lb.
The average per person in U.S. = 65 lb. ÷ 50 = 1.3 lb.

Page 105

26. 144 × ⅜ gal. = 54 gal., the quantity secured.

27. 54 × 2¼ lb. = 121½ lb., the yield of rubber from this tapping.

28. 121½ lb. of rubber were obtained at the first tapping [Ans. to Ex. 27];
16 × 121½ lb. = 1944 lb., the rubber produced during the season.

29. There were 144 trees [Ex. 26]; $1944 \text{ lb.} \div 144 = 13\frac{1}{2}$ lb., the yield per tree.

30. $121\frac{1}{2} \text{ lb.} \div 27 = 4\frac{1}{2}$ lb., the amount per hour.

31. A loaf weighed $2\frac{2}{3} \times 4\frac{1}{2} \text{ lb.} = 12$ lb.; from Ex. 29, the total amount of rubber was 1944 lb.; hence, the number of loaves $= 1944 \text{ lb.} \div 12$ lb., or 162 loaves.

32. From Ex. 29, the amount of rubber = 1944 lb.; the number of chests = $1944 \text{ lb.} \div 300$ lb., or 6 chests and 144 lb.; as each loaf weighed 12 lb. [solution of Ex. 31], the number of loaves for a smaller package $= 144 \text{ lb.} \div 12$ lb., or 12 loaves; hence, there were 6 chests and 12 loaves.

33. From Ex. 29, the amount of rubber = 1944 lb.; $\$2410.56 \div 1944 = \$1.24$, the price per pound.

34. From Ex. 26, there were 144 trees; from Ex. 33, the value of the rubber was \$2410.56; $\$2410.56 \div 144 = \$16.74$, the value per tree.

Page 106

35. Since 25,000 T. was $\frac{5}{12}$ of the world's production, $\frac{1}{12} = \frac{1}{5}$ of 25,000 T. = 5000 T., and $\frac{12}{12}$, or the world's production $= 12 \times 5000 \text{ T.} = 60,000$ T.

36. $\frac{9}{25}$ of 24,675 T. = 8883 T., the quantity thus used.

37. The total number of pairs = 24,686,643 + 18,847,865 + 6,445,231, or 49,979,739 pairs.

38. $13 \times \$1.75 = \$22.75$, the cost of the eggs.

39. From Ex. 38, the number of ounces = 13; 13 oz. $-\frac{1}{2}$ oz., or $12\frac{1}{2}$ oz., hatched; then, the number of silkworms obtained $= 12\frac{1}{2} \times 36,000 = 450,000$.

40. The number hatched the first day $= \frac{1}{20}$ of 450,000 = 22,500.
The number hatched the second day $= \frac{3}{8}$ of 450,000 = 168,750.
The number hatched the third day $= \frac{2}{5}$ of 450,000 = 180,000.
The number hatched the fourth day $= \frac{1}{8}$ of 450,000 = 56,250.
The number hatched the fifth day $= \frac{1}{20}$ of 450,000 = 22,500.

41. The quantity of leaves consumed $= 12\frac{1}{2} \times 1800 \text{ lb.} = 22,500$ lb.;
The number of mulberry trees $= 22,500 \text{ lb.} \div 125$ lb., or 180 trees.

42. The total number [Ex. 40] = 450,000; $\frac{1}{4}$ of 450,000, or 112,500, died; then, the number that lived = 450,000 − 112,500 = 337,500.

Page 107

43. The number of pounds $= 337,500 \div 250$, or 1350 lb.

44. They retained 1.00 − .68, or .32, of their weight; hence,
The choked cocoons weighed $.32 \times 1350 \text{ lb.} = 432$ lb.

45. $432 \times \$\frac{7}{8} = \$378$, the value.

46. From Ex. 39 and 42, ¼ of the 36,000 worms from 1 oz. of eggs died, leaving 27,000 ; from Ex. 43, 250 fresh cocoons weighed 1 lb. ; then, the weight of fresh cocoons per ounce of eggs = 27,000 ÷ 250, or 108 lb. ;

From Ex. 44, the weight of the choked cocoons was 1.00 – .68, or .32, of their live weight ; hence their weight when choked = .32 × 108 lb. = 34.56 lb. ;

The value per pound [Ex. 45] = $⅞ ; 34.56 × $⅞ = $30.24, the total value.

47. The total weight of choked cocoons [Ans. to Ex. 44] = 432 lb. ; .275 × 432 lb. = 118.8 lb., the amount of silk.

48. In 1 day 6 women reeled 118.8 lb. ÷ 26.4 = 4.5 lb. ;
In 1 day 1 woman reeled 4.5 lb. ÷ 6 = .75 lb., or ¾ lb.

49. The quantity [Ex. 47] = 118.8 lb. ; 118.8 × $4.15 = $493.02, the value.

50. 2 × 40,000 × ¾ × ½ × 300 × ⅔ ÷ 40,000 = 150, the number of ounces he had to sell.

51. 150 × $2¼ = $337½, the value.

52. The world's production = 1,256,625 lb. + 9,803,855 lb. + 12,288,565 lb. + 10,515,940 lb. + 8,502,130 lb. = 42,367,115 lb.

53. The cost of 240 lb. from Italy = 240 × $4.40 = $1056 ;
The cost of 240 lb. from Japan = 240 × $3.95 = $948 ;
The cost of 240 lb. from Shanghai = 240 × $4.70 = $1128 ;
The cost of 240 lb. from Canton = 240 × $3.25 = $780.

Page 114

2. At $100 each, 32,425 telephones would cost $3,242,500 ; but $12.50 is ⅛ of $100 ; hence, the cost = ⅛ of $3,242,500 = $405,312.50.

3. On each suit he gained $19.50 – $12 = $7.50 ;
On 96 suits he gained 96 × $7.50 = $720.

4. His rightful gain per overcoat = $60 – $35 = $25 ;
His average loss in bad debts, per overcoat = $425 ÷ 125 = $3.40 ;
Hence, his average gain per overcoat = $25 – $3.40 = $21.60.

5. At $1 per bushel, 65 bu. would bring $65 ;
At $.05 per bushel, 65 bu. would bring 65 × $.05 = $3.25 ; then,
At $1 – $.05, or $.95, per bushel, the receipts = $65 – $3.25 = $61.75.

6. 284 bu. brought 284 × $2¼ = $639 ; the charges for storage and selling = 284 × (15¢ + 5¢) = 284 × 20¢ = $56.80 ; the total charges = $56.80 + $32 = $88.80 ; hence, the proceeds = $639 – $88.80 = $550.20.

7. 432 boxes @ $1 would bring $432 ; @ $.10, $43.20 ; and @ $1.10, $432 + $43.20, or $475.20 ; then, the proceeds = $475.20 – $77.50 = $397.70.

8. The proceeds per box = 6½ − ¾, or 5¾, shillings;
The total proceeds in shillings = 360 × 5¾, or 2070 shillings;
Hence, the proceeds = 2070 × $.24⅓ = $503.70.

9. The total proceeds (Ans. to Ex. 5, 6, 7, and 8) = $61.75 + $550.20 + $397.70 + $503.70 = $1513.35; from Ex. 5 and 6, the number of bushels = 65 + 284, or 349 bu.; 349 × 45¢ = $157.05, one expense; from Ex. 7 and 8, the number of boxes = 432 + 360, or 792 boxes; 792 × $¼ = $198, the other expense; hence, the cost of production = $157.05 + $198 = $355.05; and the net income = $1513.35 − $355.05 = $1158.30.

10. 1,836,000 bricks = 1836 M bricks; 1836 × $9¼ = $16,983, the cost.

11. 22½ tons cost 22½ × $16.80 = $378;
2240 lb. cost 1680¢; 1 lb. cost $\frac{1680}{2240}$¢, or ¾¢.

Page 115

12. 1650 lb. = 16.5 cwt.; 16.5 × $9.75 = $160.875, or $160.88.

13. At 50¢, or $½, per bushel the cost = 7425 × $½ = $3712.50;
At ⅛¢ per bushel the cost = 7425 × $.00⅛ = $9.28⅛;
At 50¢ − ⅛¢, or 49⅞¢, per bushel the cost = $3712.50 − $9.28⅛ = $3703.21⅞, or $3703.22.

14. 1460 yd. @ $1 cost $1460; @ $¼, ¼ of $1460 = $365; and @ $1 − $¼, or $.75, $1460 − $365 = $1095.

15. 2025 baskets @ $1¼ cost 2025 × $1¼ = $2531.25.

16. 6847 lb. = 68.47 cwt.; the cost = 68.47 × $4¼ = $290.99¾, or $291.

17. The car load of wheat cost 1075 × $.77⅜ = $831.78⅛, or $831.79.

18. Since $9360 is ⅓ more than the cost, it is 4/3 of the cost; ⅓ of the cost = ¼ of $9360 = $2340; therefore, the cost = $9360 − $2340 = $7020.

19. The cost of each = $3300 ÷ 12 = $275; then, the selling price of each = 7/5 of $275, or $385, plus $25 = $410.

The gain on each = $410 − $275 = $135; the total gain = 12 × $135 = $1620.

20. $62,500 − $43,750 = $18,750, the amount left;
$ $\frac{18750}{62500}$ = $\frac{3}{10}$, the part left for the heirs.

21. Since ⅓ of his share = $15,120, his share = 3 × $15,120 = $45,360; since ⅘ of the business = $45,360, ⅕ of the business = ¼ of $45,360 = $11,340, and the business was worth 5 × $11,340 = $56,700.

22. The number of yards = 42½ + 45¾ + 46 + 44 + 47¾ + 48½ + 48½ + 45¾ + 47 + 43¾, or 459½ yd.; 459½ × 4¾¢ = $21.82⅝, or $21.83, the cost.

23. 6000 bales weighed 6000 × 500 lb. = 3,000,000 lb.; 3,000,000 × \$.0912 = \$273,600, the cost; he sold ⅓ of 3,000,000 lb., or 1,000,000 lb., @ 9.12¢ − .04¢, or 9.08¢; 1,000,000 × \$.0908 = \$90,800; he sold the rest, 2,000,000 lb., @ 9.08¢ + .06¢, or 9.14¢; 2,000,000 × \$.0914 = \$182,800; hence, he received in all \$90,800 + \$182,800 = \$273,600; therefore, he neither gained nor lost.

24. Dividing the number of pounds in each car load by 56, we find the number of bushels in each to be, respectively, 850, 900, 875, and 950;

The total number of bushels = 850 + 900 + 875 + 950, or 3575 bu.;
The cost = 3575 × \$.42¾ = \$1528.31¼, or \$1528.32;
For the 1st car load he received 850 × \$.42⅞ = \$364.43¾, or \$364.44;
For the 2d car load he received 900 × \$.43⅝ = \$392.62½, or \$392.63;
For the 3d car load he received 875 × \$.43⅜ = \$379.53⅛, or \$379.54;
For the 4th car load he received 950 × \$.44¼ = \$420.37½, or \$420.38;
He received, in all, \$364.44 + \$392.63 + \$379.54 + \$420.38 = \$1556.99;
His gain = \$1556.99 − \$1528.32 = \$28.67.

Page 118

2. Let $x =$ the number
Then, $x + 15 = 51$
Subtracting 15 from both members, $x = 36$, the number

3. Let $x =$ the number
Then, $x - 32 = 60$
Adding 32 to both members, $x = 92$, the number

4. Let $x =$ the number
Then, $3x = 78$
Dividing both members by 3, $x = 26$, the number

5. Let $x =$ the number
Then, $\frac{1}{8}x = 62$
Multiplying both members by 8, $x = 496$, the number

6. Let $x =$ the number
Then, $87.5 + x = 100$
Subtracting 87.5 from both members, $x = 12.5$, the number

7. Let $x =$ the number
Then, $12x = 15$
Dividing both members by 12, $x = 1\frac{1}{4}$, the number

8. Let $x =$ the number of books
Then, $\frac{1}{6}x = 18$
Multiplying both members by 6, $x = 108$, the number of books

9. Let $x =$ the number
Then, $x + 20 - 14 = 19$
Adding 14 to both members, $x + 20 = 33$
Subtracting 20 from both members, $x = 13$, the number

10. Let $x =$ the number
Then, $\frac{1}{2}x + 11 = 37$
Subtracting 11 from both members, $\frac{1}{2}x = 26$, one-half of the number
Multiplying both members by 2, $x = 52$, the number

Page 119

2. $\frac{3}{2}x = 9$
Multiplying both members by 2, $3x = 18$
Dividing both members by 3, $x = 6$

3. $\frac{4}{3}x = 8$
Multiplying both members by 3, $4x = 24$
Dividing both members by 4, $x = 6$

4. $\frac{5}{2}x = 10$
Multiplying both members by 2, $5x = 20$
Dividing both members by 5, $x = 4$

5. $\frac{2}{3}x = 14$
Multiplying both members by 3, $2x = 42$
Dividing both members by 2, $x = 21$

6. $\frac{3}{5}x = 21$
Multiplying both members by 5, $3x = 105$
Dividing both members by 3, $x = 35$

7. $\frac{2}{3}x = 30$
Multiplying both members by 3, $2x = 90$
Dividing both members by 2, $x = 45$

8. $\frac{4}{5}x = 28$
Multiplying both members by 5, $4x = 140$
Dividing both members by 4, $x = 35$

9. $\frac{5}{6}x = 20$
Multiplying both members by 6, $5x = 120$
Dividing both members by 5, $x = 24$

10. $\frac{5}{8}x = 15$
Multiplying both members by 8, $5x = 120$
Dividing both members by 5, $x = 24$

11. $\frac{7}{3}x = 21$
Multiplying both members by 3, $7x = 63$
Dividing both members by 7, $x = 9$

12. $\frac{7}{8}x = 63$
Multiplying both members by 8, $7x = 504$
Dividing both members by 7, $x = 72$

13. $\frac{6}{7}x = 48$
Multiplying both members by 7, $6x = 336$
Dividing both members by 6, $x = 56$

14. Let $x =$ the number
Then, $\frac{3}{4}x = 18$
Multiplying both members by 4, $3x = 72$
Dividing both members by 3, $x = 24$, the number

15. Let $x =$ the number of pupils
Then, $\frac{5}{8}x = 250$
Multiplying both members by 8, $5x = 2000$
Dividing both members by 5, $x = 400$, the number of pupils

16. Let $x =$ the number of games
Then, $\frac{2}{3}x = 16$
Multiplying both members by 3, $2x = 48$
Dividing both members by 2, $x = 24$, the number of games

17. Let $x =$ the number of persons
Then, $\frac{3}{8}x = 240$
Multiplying both members by 8, $3x = 1920$
Dividing both members by 3, $x = 640$, the number of persons

18. Let $x =$ the width in feet
Then, $\frac{3}{5}x = 48$
Multiplying both members by 5, $3x = 240$
Dividing both members by 3, $x = 80$, the width in feet

19. Let $x =$ the number of minutes for a round trip
Then, $\frac{4}{15}x = 9\frac{3}{5}$
Multiplying both members by 15, $4x = 144$
Dividing both members by 4, $x = 36$, the number of minutes

Page 122

3. $7x + 12 = 5x + 16$
Transposing, $7x - 5x = 16 - 12$
Uniting terms, $2x = 4$
Dividing by 2, $x = 2$

4. $5x - 20 = 2x + 13$
Transposing, $5x - 2x = 13 + 20$
Uniting terms, $3x = 33$
Dividing by 3, $x = 11$

5. $9x - 17 = 23 + x$
Transposing, $9x - x = 23 + 17$
Uniting terms, $8x = 40$
Dividing by 8, $x = 5$

6. $22 - 6x = 40 - 8x$
Transposing, $8x - 6x = 40 - 22$
Uniting terms, $2x = 18$
Dividing by 2, $x = 9$

7. $2x + 3x - 2x = 21$
Uniting terms, $3x = 21$
Dividing by 3, $x = 7$

8. $9x - 4x + 2x = 14$
Uniting terms, $7x = 14$
Dividing by 7, $x = 2$

9. $8x + 5x - 5x = 48$
Uniting terms, $8x = 48$
Dividing by 8, $x = 6$

10. $6x - 2x - x = 45$
Uniting terms, $3x = 45$
Dividing by 3, $x = 15$

11. $5x + 8x + 9x = 44$
Uniting terms, $22x = 44$
Dividing by 22, $x = 2$

12. $7x + 6x - 7x = 42$
Uniting terms, $6x = 42$
Dividing by 6, $x = 7$

13. $4x - 11 + 2x = 2x - 5$
Transposing, $4x + 2x - 2x = 11 - 5$
Uniting terms, $4x = 6$
Dividing by 4, $x = 1\frac{1}{2}$

14. $3x + 14 + 7x = 78 + 2x$
Transposing, $3x + 7x - 2x = 78 - 14$
Uniting terms, $8x = 64$
Dividing by 8, $x = 8$

15. $44 - 3x - 2x = 79 - 12x$
Transposing, $12x - 3x - 2x = 79 - 44$
Uniting terms, $7x = 35$
Dividing by 7, $x = 5$

16. $62 - 2x - 12 = 75 - 27x$
Transposing, $27x - 2x = 75 - 62 + 12$
Uniting terms, $25x = 25$
Dividing by 25, $x = 1$

17. $14 - 21 - 30 = x - 2x - 21$
Transposing, $2x - x = 21 - 21 + 30 - 14$
Uniting terms, $x = 16$

18. $22 - 15 + 21 = 2x - 4 + 6x$
Transposing, $22 - 15 + 21 + 4 = 2x + 6x$
Uniting terms, $32 = 8x$, or $8x = 32$
Dividing by 8, $x = 4$

19. $46 + 3x - 60 = 5x - 10 - 4x$
Transposing, $3x - 5x + 4x = 60 - 46 - 10$
Uniting terms, $2x = 4$
Dividing by 2, $x = 2$

20. $8x - 20 - 2x = 30 - 2x + 14$
Transposing, $8x - 2x + 2x = 30 + 14 + 20$
Uniting terms, $8x = 64$
Dividing by 8, $x = 8$

21. $5x + 16 - 6x = 16 + 24 - 6x$
Transposing, $5x - 6x + 6x = 16 - 16 + 24$
Uniting terms, $5x = 24$
Dividing by 5, $x = 4\frac{4}{5}$

22. $6x + 5x - 70 = 5x + 54 - 70$
Transposing, $6x + 5x - 5x = 54 - 70 + 70$
Uniting terms, $6x = 54$
Dividing by 6, $x = 9$

23. $10x - 39 - 4x - 9x + 42 + 12x = 30 + 12 - 4x$
Transposing, $10x - 4x - 9x + 12x + 4x = 30 + 12 + 39 - 42$
Uniting terms, $13x = 39$
Dividing by 13, $x = 3$

24. $16x + 12 - 75 + 2x - 12 - 110 = 8x - 50 - 25$
Transposing, $16x + 2x - 8x = 75 - 12 + 12 + 110 - 50 - 25$
Uniting terms, $10x = 110$
Dividing by 10, $x = 11$

25. $11x - 60 + 5x + 17 - 2x - 3x + 41 = 106 + 2x$
Transposing, $11x + 5x - 2x - 3x - 2x = 106 + 60 - 17 - 41$
Uniting terms, $9x = 108$
Dividing by 9, $x = 12$

26. $18x + 16 = 8 + 12x + 8 - 13 + 25x - 9 + 100 - 25x$
Transposing, $18x - 12x - 25x + 25x = 8 + 8 - 13 - 9 + 100 - 16$
Uniting terms, $6x = 78$
Dividing by 6, $x = 13$

27. $14x - 35 = 9 - 11x + 4 + 16 - 10x + x + 136 - 16x$
Transposing, $14x + 11x + 10x - x + 16x = 9 + 4 + 16 + 136 + 35$
Uniting terms, $50x = 200$
Dividing by 50, $x = 4$

Page 123

29. $\frac{1}{4}x + \frac{1}{6}x = 10$
Multiplying by 12, $3x + 2x = 120$
Uniting terms, $5x = 120$
Dividing by 5, $x = 24$

30. $\frac{3}{4}x - \frac{1}{9}x = 23$
Multiplying by 36, $27x - 4x = 828$
Uniting terms, $23x = 828$
Dividing by 23, $x = 36$

31. $\frac{9}{10}x - 10 = \frac{2}{5}x$
Multiplying by 10, $9x - 100 = 4x$
Transposing, $9x - 4 = 100$
Uniting terms, $5x = 100$
Dividing by 5, $x = 20$

32. $\frac{1}{2}x + \frac{7}{8}x = 440$
Multiplying by 8, $4x + 7x = 3520$
Uniting terms, $11x = 3520$
Dividing by 11, $x = 320$

33. $\frac{2}{3}x = \frac{1}{3}x - \frac{7}{6}x + 27$
Multiplying by 6, $4x = 2x - 7x + 162$
Transposing, $4x - 2x + 7x = 162$
Uniting terms, $9x = 162$
Dividing by 9, $x = 18$

34. $\frac{4}{5}x + 12 = \frac{3}{8}x + 29$
Multiplying by 40, $32x + 480 = 15x + 1160$
Transposing, $32x - 15x = 1160 - 480$
Uniting terms, $17x = 680$
Dividing by 17, $x = 40$

35. $\frac{9}{4}x - 50 = 15 - \frac{1}{14}x$
Multiplying by 28, $63x - 1400 = 420 - 2x$
Transposing, $63x + 2x = 420 + 1400$
Uniting terms, $65x = 1820$
Dividing by 65, $x = 28$

36. $\frac{1}{2}x + \frac{1}{3}x + \frac{3}{4}x + \frac{4}{5}x = 143$
Multiplying by 60, $30x + 20x + 45x + 48x = 8580$
Uniting terms, $143x = 8580$
Dividing by 143, $x = 60$

---

2. Let $x =$ the smaller part
Then, $3x =$ the larger part
$x + 3x$, or $4x = 116$
$x = 29$, the smaller part
$3x = 87$, the larger part

Page 124

3. Let $x =$ the number of clams one boy dug
Then, $3x =$ the number the other boy dug
$x + 3x$, or $4x = 160$
$x = 40$, the number one boy dug
$3x = 120$, the number the other boy dug

4. Let $x =$ the number of cubic feet occupied by the steam
Then, $2x =$ the number of cubic feet occupied by the water
$x + 2x$, or $3x = 120$
$x = 40$, the number of cubic feet of steam
$2x = 80$, the number of cubic feet of water

5. Let $x =$ the number
Then, $x + 5x$, or $6x = 12$
$x = 2$, the number

6. Let $x =$ the number of dollars one boy furnished
Then, $4x =$ the number of dollars the other furnished
$x + 4x$, or $5x = 45$
$x = 9$, the number of dollars one furnished
$4x = 36$, the number of dollars the other furnished

7. Let $x =$ the number of dollars due one boy
Then, $4x =$ the number of dollars due the other
$x + 4x$, or $5x = 52.50$
$x = 10.50$, the number of dollars due one boy
$4x = 42$, the number of dollars due the other

8. Let $x =$ the smaller part
Then, $3x =$ the larger part
$x + 3x$, or $4x = 72$
$x = 18$, the smaller part
$3x = 54$, the larger part

9. Let $x =$ the smaller part
Then, $5x =$ the larger part
$x + 5x$, or $6x = 78$
$x = 13$, the smaller part
$5x = 65$, the larger part

10. Let $x =$ the number
Then, $x + .04x$, or $1.04x = 46.8$
Dividing by 1.04, $x = 45$, the number

11. Let $x =$ the number
Then, $x - .35\,x$, or $.65\,x = 52$
Dividing by .65, $x = 80$, the number

12. Let $x =$ the number of dollars Mr. Jones invested
Then, $3\,x =$ the number of dollars Mr. Hollis invested
And $5\,x =$ the number of dollars Mr. Frye invested
$x + 3\,x + 5\,x$, or $9\,x = 225{,}000$
$x = 25{,}000$, the number of dollars Mr. Jones invested
$3\,x = 75{,}000$, the number of dollars Mr. Hollis invested
$5\,x = 125{,}000$, the number of dollars Mr. Frye invested

13. Let $x =$ Mr. Jones's share, in dollars
Then, $3\,x =$ Mr. Hollis's share, in dollars
And $5\,x =$ Mr. Frye's share, in dollars
$x + 3\,x + 5\,x$, or $9\,x = 2340$
$x = 260$, Mr. Jones's share, in dollars
$3\,x = 780$, Mr. Hollis's share, in dollars
$5\,x = 1300$, Mr. Frye's share, in dollars

14. Let $x =$ the cost of mining per ton, in dollars
Then, $x + .10 =$ the cost of shipping per ton, in dollars
$x + x + .10 = 1.90$
$2\,x = 1.90 - .10 = 1.80$
$x = .90$, the cost of mining per ton, in dollars

15. Let $x =$ the weight of the wagon, in pounds
Then, $x + 1800 =$ the weight of the coal, in pounds
$x + x + 1800 = 4200$
$2\,x = 4200 - 1800 = 2400$
$x = 1200$, the weight of the wagon, in pounds
$x + 1800 = 3000$, the weight of the coal, in pounds

Page 125

16. Let $x =$ the number of feet below ground
Then, $16\,x + 2 =$ the number of feet above ground
$x + 16\,x + 2 = 172$
$17\,x = 170$
$x = 10$, the number of feet below ground
Hence, $16\,x + 2 = 162$, the height above ground, in feet

17. Let $x =$ the number of gallons per small pump
Then, $4x =$ the number of gallons per large pump
$2(4x) + 4x = 4800$
$8x + 4x$, or $12x = 4800$
$x = 400$, the number of gallons per small pump
$4x = 1600$, the number of gallons per large pump

18. Let $x =$ the number of violins made in Mass.
Then, $2x =$ the number of violins made in N.Y.
$x + 2x = \frac{1}{2}$ of 1500
$3x = 750$
$x = 250$, the number of violins made in Mass.
$2x = 500$, the number of violins made in N.Y.

19. Let $x =$ the number of 16-candle power lamps
Then, $2x =$ the number of 20-candle power lamps
$16x + 20(2x) = 224$
$16x + 40x$, or $56x = 224$
$x = 4$, the number of 16-candle power lamps
$2x = 8$, the number of 20-candle power lamps

21. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10
$20 + 1(x - 10) = 30$
$20 + x - 10 = 30$
$x = 30 - 20 + 10 = 20$, the total number of words

22. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10
$25 + 2(x - 10) = 39$
$25 + 2x - 20 = 39$
$2x = 39 - 25 + 20 = 34$
$x = 17$, the total number of words

23. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10
$25 + 2(x - 10) = 61$
$25 + 2x - 20 = 61$
$2x = 61 - 25 + 20 = 56$
$x = 28$, the total number of words

24. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10

$$30 + 2(x - 10) = 66$$
$$30 + 2x - 20 = 66$$
$$2x = 66 - 30 + 20 = 56$$
$x = 28$, the total number of words

25. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10

$$25 + 1(x - 10) = 52$$
$$25 + x - 10 = 52$$
$x = 52 - 25 + 10 = 37$, the total number of words

26. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10

$$40 + 3(x - 10) = 55$$
$$40 + 3x - 30 = 55$$
$$3x = 55 - 40 + 30 = 45$$
$x = 15$, the total number of words

27. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10

$$50 + 3(x - 10) = 83$$
$$50 + 3x - 30 = 83$$
$$3x = 83 - 50 + 30 = 63$$
$x = 21$, the total number of words

28. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10

$$60 + 4(x - 10) = 96$$
$$60 + 4x - 40 = 96$$
$$4x = 96 - 60 + 40 = 76$$
$x = 19$, the total number of words

29. Let $x =$ the number of words in the message
Then, $x - 10 =$ the number of words in excess of 10

$$75 + 5(x - 10) = 95$$
$$75 + 5x - 50 = 95$$
$$5x = 95 - 75 + 50 = 70$$
$x = 14$, the total number of words

Page 126

30. Let $x =$ the total number of minutes
Then, $x - 3 =$ the number of minutes in excess of 3
$25 + 5(x - 3) = 50$
$25 + 5x - 15 = 50$
$5x = 50 - 25 + 15 = 40$
$x = 8$, the total number of minutes

31. Let $x =$ the number of piano factories in Berlin
Then, $3x + 15 = 435$
$3x = 435 - 15 = 420$
$x = 140$, the number of piano factories in Berlin

32. Let $x =$ the number of square yards inside
Then, $4000 + 4x =$ the number of square yards outside
$x + 4000 + 4x = 64{,}000$
$5x = 64{,}000 - 4000 = 60{,}000$
$x = 12{,}000$, the inside plastering, in square yards
$4000 + 4x = 52{,}000$, the outside plastering, in square yards

33. Let $x =$ the number
Then, $x + \frac{1}{2}x = 54$
Multiplying by 2, $2x + x = 108$
$3x = 108$
$x = 36$, the number

34. Let $x =$ the number
Then, $\frac{7}{8}x = 112$
Multiplying by 8, $7x = 896$
$x = 128$, the number

35. Let $x =$ the number
Then, $x - \frac{1}{5}x = 84$
Multiplying by 5, $5x - x = 420$
$4x = 105$, the number

36. Let $x =$ the number of miners
Then, $\frac{3}{19}x = 21{,}000$
Multiplying by 19, $3x = 399{,}000$
$x = 133{,}000$, the number of miners

37. Let $x =$ the number of pounds of green hides
Then, $\frac{3}{4}x = 240$
Multiplying by 4, $3x = 960$
$x = 320$, the number of pounds of green hides

38. Let $x =$ the price in dollars, at the beginning
Then, $x - \frac{3}{14}x = 2.20$
Multiplying by 14, $14x - 3x = 30.80$
$11x = 30.80$
$x = 2.80$, the price in dollars

39. Let $x =$ the length in feet
Then, $\frac{6}{11}x = 1800$
Multiplying by 11, $6x = 19{,}800$
$x = 3300$, the number of feet in length

40. Let $x =$ the number of miles by boat
Then, $\frac{5}{6}x = 35$
Multiplying by 6, $5x = 210$
$x = 42$, the number of miles by boat

41. Let $x =$ the number of steam vessels
Then, $\frac{1}{3}x - 5 = 21$
Multiplying by 3, $x - 15 = 63$
$x = 63 + 15 = 78$, the number of steam vessels

42. Let $x =$ the height of the American Falls, in feet
Then, $\frac{10}{11}x + 8 = 158$
Multiplying by 11, $10x + 88 = 1738$
$10x = 1738 - 88 = 1650$
$x = 165$, the number of feet, American Falls

Page 127

44. Let $x =$ the number of cents I had at first
Then, $x = \frac{1}{2}x + \frac{1}{4}x + \frac{1}{5}x + 80$
Multiplying by 20, $20x = 10x + 5x + 4x + 1600$
$20x - 10x - 5x - 4x = 1600$
$x = 1600$, the number of cents, $= \$16$

45. Let $x =$ the number of dollars in his income
Then, $x = 2200 + \frac{3}{5}x + 700$
Multiplying by 5, $5x = 11,000 + 3x + 3500$
$5x - 3x = 11,000 + 3500$
$2x = 14,500$
$x = 7250$, his income in dollars

46. Let $x =$ the number of dollars per month
Then, $x = 14 + \frac{2}{3}x + \frac{4}{5}$ of $\frac{1}{3}x - 4$
$x = 14 + \frac{2}{3}x + \frac{4}{15}x - 4$
Multiplying by 15, $15x = 210 + 10x + 4x - 60$
$15x - 10x - 4x = 210 - 60$
$x = 150$, his salary in dollars

47. Let $x =$ the number
Then, $2x + \frac{1}{2}x + \frac{1}{3}x + 33 = 152$
Multiplying by 6, $12x + 3x + 2x + 198 = 912$
$17x = 912 - 198 = 714$
$x = 42$, the number

48. Let $x =$ the number of passengers
Then, $x = 805 + \frac{1}{5}x + \frac{1}{3}x$
Multiplying by 15, $15x = 12,075 + 3x + 5x$
$15x - 3x - 5x = 12,075$
$7x = 12,075$
$x = 1725$, the number of passengers

49. Let $x =$ the number of steamers
Then, $\frac{1}{4}x + 25 =$ the number of sailing vessels
$x + \frac{1}{4}x + 25 = 1025$
Multiplying by 4, $4x + x + 100 = 4100$
$5x = 4100 - 100 = 4000$
$x = 800$, the number of steamers
$\frac{1}{4}x + 25 = 225$, the number of sailing vessels

50. Let $x =$ the number of boys in the club
Then, $x = 20 + \frac{2}{3}x + \frac{1}{4}x$
Multiplying by 12, $12x = 240 + 8x + 3x$
$12x - 8x - 3x = 240$
$x = 240$, the number of boys in the club

Page 128

52. Let $x =$ the greater part
Then, $84 - x =$ the less part
$\frac{1}{2}x = \frac{5}{6}(84 - x)$
$\frac{1}{2}x = 70 - \frac{5}{6}x$
Multiplying by 6, $3x = 420 - 5x$
$3x + 5x$, or $8x = 420$
$x = 52\frac{1}{2}$, the greater part
$84 - x = 31\frac{1}{2}$, the less part

53. Let $x =$ the greater part
Then, $100 - x =$ the less part
$\frac{1}{2}x = \frac{3}{4}(100 - x)$
$\frac{1}{2}x = 75 - \frac{3}{4}x$
Multiplying by 4, $2x = 300 - 3x$
$2x + 3x$, or $5x = 300$
$x = 60$, the greater part
$100 - x = 40$, the less part

54. Let $x =$ the number of days in the Ala. term
Then, $\frac{3}{5}x = \frac{1}{3}$ of 189
$\frac{3}{5}x = 63$
Multiplying by 5, $3x = 315$
$x = 105$, the number of days in the Ala. term

55. Let $x =$ the weight of the locomotive, in tons
Then, $\frac{1}{4}x =$ the weight of the baggage car, in tons
And $.27x =$ the weight of each coach, in tons
$x + \frac{1}{4}x + 7(.27x) = 502.4$
$x + \frac{1}{4}x + 1.89x = 502.4$
Multiplying by 4, $4x + x + 7.56x = 2009.6$
$12.56x = 2009.6$
Dividing by 12.56, $x = 160$, the locomotive's weight, in tons
$\frac{1}{4}x = 40$, the baggage car's weight, in tons
$.27x = 43.2$, each coach's weight, in tons

56. Let $x =$ the length in feet

Then, $\frac{3}{4}x =$ the width in feet

$$2x + 2\left(\tfrac{3}{4}x\right) = 70$$

$$2x + \tfrac{3}{2}x = 70$$

Multiplying by 2, $4x + 3x = 140$

$$7x = 140$$

$x = 20$, the length in feet

$\frac{3}{4}x = 15$, the width in feet

57. Let $x =$ the number of car loads of ore

Then, $\frac{7}{8}x =$ the number of car loads of coke

And $\frac{3}{8}x =$ the number of car loads of limestone

$$x + \tfrac{7}{8}x + \tfrac{3}{8}x = 450$$

Multiplying by 8, $8x + 7x + 3x = 3600$

$$18x = 3600$$

$x = 200$, the number of car loads of ore

$\frac{7}{8}x = 175$, the number of car loads of coke

$\frac{3}{8}x = 75$, the number of car loads of limestone

Page 130

2. $5x + 2y = 22$ (1)

$5x + y = 21$ (2)

Subtracting, $y = 1$

Substituting 1 for y in (2), $5x + 1 = 21$; $\therefore x = 4$

3. $3x + 4y = 23$ (1)

$3x + 2y = 19$ (2)

Subtracting, $2y = 4$; $\therefore y = 2$

Substituting 2 for y in (2), $3x + 4 = 19$; $\therefore x = 5$

4. $3x - 4y = 16$ (1)

$5x + 4y = 48$ (2)

Adding, $8x = 64$; $\therefore x = 8$

Substituting 8 for x in (2), $40 + 4y = 48$; $\therefore y = 2$

5. $6x + 5y = 70$ (1)

$x - 5y = 0$ (2)

Adding, $7x = 70$; $\therefore x = 10$

Substituting 10 for x in (1), $60 + 5y = 70$; $\therefore y = 2$

Page 131

6. $4x + 5y = 32$ (1)

$\underline{2x + 5y = 26}$ (2)

Subtracting, $2x = 6;\ \therefore x = 3$

Substituting 3 for x in (2), $6 + 5y = 26;\ \therefore y = 4$

7. $7x - 2y = 22$ (1)

$\underline{3x + 2y = 18}$ (2)

Adding, $10x = 40;\ \therefore x = 4$

Substituting 4 for x in (2), $12 + 2y = 18;\ \therefore y = 3$

8. $6x + 7y = 13$ (1)

$\underline{6x + y = 7}$ (2)

Subtracting, $6y = 6;\ \therefore y = 1$

Substituting 1 for y in (2), $6x + 1 = 7;\ \therefore x = 1$

9. $9x - 2y = 41$ (1)

$\underline{7x - 2y = 31}$ (2)

Subtracting, $2x = 10;\ \therefore x = 5$

Substituting 5 for x in (2), $35 - 2y = 31$

Transposing, $35 - 31 = 2y;\ \therefore y = 2$

10. $5x - 4y = 8$ (1)

$\underline{3x - 4y = 0}$ (2)

Subtracting, $2x = 8;\quad \therefore x = 4$

Substituting 4 for x in (2), $12 - 4y = 0$

Transposing, $12 = 4y;\ \therefore y = 3$

11. $8x + 5y = 18$ (1)

$\underline{8x + 3y = 14}$ (2)

Subtracting, $2y = 4;\ \therefore y = 2$

Substituting 2 for y in (2), $8x + 6 = 14;\ \therefore x = 1$

12. $7x - 3y = 39$ (1)

$\underline{5x - 3y = 27}$ (2)

Subtracting, $2x = 12;\ \therefore x = 6$

Substituting 6 for x in (2), $30 - 3y = 27$

Transposing, $30 - 27 = 3y;\ \therefore y = 1$

13. $5y - 4x = 9$ (1)
$\underline{6y + 4x = 46}$ (2)
Adding, $11y = 55$; $\therefore y = 5$
Substituting 5 for y in (2), $30 + 4x = 46$; $\therefore x = 4$

Page 132

15. $9x + 2y = 20$ (1)
$3x + y = 7$ (2)
Multiplying (2) by 2, $6x + 2y = 14$ (3)
Subtracting (3) from (1), $3x = 6$; $\therefore x = 2$
Substituting 2 for x in (2), $6 + y = 7$; $\therefore y = 1$

16. $6x + 5y = 28$ (1)
$2x + 3y = 12$ (2)
Multiplying (2) by 3, $6x + 9y = 36$ (3)
Subtracting (1) from (3), $4y = 8$; $\therefore y = 2$
Substituting 2 for y in (2), $2x + 6 = 12$; $\therefore x = 3$

17. $7x + 4y = 40$ (1)
$3x + 2y = 18$ (2)
Multiplying (2) by 2, $6x + 4y = 36$ (3)
Subtracting (3) from (1), $x = 4$
Substituting 4 for x in (2), $12 + 2y = 18$; $\therefore y = 3$

18. $10x + 3y = 62$ (1)
$6x + 4y = 46$ (2)
Multiplying (1) by 4, $40x + 12y = 248$ (3)
Multiplying (2) by 3, $18x + 12y = 138$ (4)
Subtracting (4) from (3), $22x = 110$; $\therefore x = 5$
Substituting 5 for x in (1), $50 + 3y = 62$; $\therefore y = 4$

19. $11x + 8y = 37$ (1)
$5x + 6y = 18$ (2)
Multiplying (1) by 3, $33x + 24y = 111$ (3)
Multiplying (2) by 4, $20x + 24y = 72$ (4)
Subtracting (4) from (3), $13x = 39$; $\therefore x = 3$
Substituting 3 for x in (2), $15 + 6y = 18$; $\therefore y = \frac{1}{2}$

20.	$18x + 2y = 9\frac{2}{3}$	(1)
	$4x + 3y = 3$	(2)
Multiplying (1) by 3,	$54x + 6y = 29$	(3)
Multiplying (2) by 2,	$8x + 6y = 6$	(4)
Subtracting (4) from (3),	$46x = 23; \quad \therefore x = \frac{1}{2}$	
Substituting $\frac{1}{2}$ for x in (2),	$2 + 3y = 3; \quad \therefore y = \frac{1}{3}$	
21.	$x + y = 10$	(1)
	$x - y = 2$	(2)
Adding,	$2x = 12; \quad \therefore x = 6$	
Substituting 6 for x in (1),	$6 + y = 10; \quad \therefore y = 4$	
22.	$5x + 2y = 49$	(1)
	$3x - 2y = 23$	(2)
Adding,	$8x = 72; \quad \therefore x = 9$	
Substituting 9 for x in (1),	$45 + 2y = 49; \quad \therefore y = 2$	
23.	$4x - y = 27$	(1)
	$x - y = 3$	(2)
Subtracting,	$3x = 24; \quad \therefore x = 8$	
Substituting 8 for x in (2),	$8 - y = 3$	
Transposing,	$8 - 3 = y; \quad \therefore y = 5$	
24.	$y + 2x = 18$	(1)
	$y - 2x = 2$	(2)
Adding,	$2y = 20; \quad \therefore y = 10$	
Substituting 10 for y in (1),	$10 + 2x = 18; \quad \therefore x = 4$	
25.	$2y - 3x = 5$	(1)
	$5y + 4x = 93$	(2)
Multiplying (1) by 4,	$8y - 12x = 20$	(3)
Multiplying (2) by 3,	$15y + 12x = 279$	(4)
Adding (3) and (4),	$23y = 299; \quad \therefore y = 13$	
Substituting 13 for y in (2),	$65 + 4x = 93; \quad \therefore x = 7$	
26.	$4x - 7y = 12$	(1)
	$3x + 5y = 50$	(2)
Multiplying (1) by 5,	$20x - 35y = 60$	(3)
Multiplying (2) by 7,	$21x + 35y = 350$	(4)
Adding (3) and (4),	$41x = 410; \quad \therefore x = 10$	
Substituting 10 for x in (2),	$30 + 5y = 50; \quad \therefore y = 4$	

27. $\frac{3x}{2} - \frac{y}{3} = 1$ (1)

$\frac{x}{4} + \frac{y}{5} = 4$ (2)

Multiplying (1) by 6, $9x - 2y = 6$ (3)
Multiplying (2) by 20, $5x + 4y = 80$ (4)
Multiplying (3) by 2, $18x - 4y = 12$ (5)
Adding (4) and (5), $23x = 92; \therefore x = 4$
Substituting 4 for x in (4), $20 + 4y = 80; \therefore y = 15$

Page 133

28. $\frac{x}{2} + \frac{y}{8} = 7$ (1)

$\frac{x}{3} + \frac{y}{4} = 6$ (2)

Multiplying (1) by 8, $4x + y = 56$ (3)
Multiplying (2) by 12, $4x + 3y = 72$ (4)
Subtracting (3) from (4), $2y = 16; \therefore y = 8$
Substituting 8 for y in (3), $4x + 8 = 56; \therefore x = 12$

29. $\frac{x}{4} + \frac{y}{2} = 13$ (1)

$\frac{x}{5} - \frac{y}{8} = 2$ (2)

Multiplying (1) by 4, $x + 2y = 52$ (3)
Multiplying (2) by 40, $8x - 5y = 80$ (4)
Multiplying (3) by 5, $5x + 10y = 260$ (5)
Multiplying (4) by 2, $16x - 10y = 160$ (6)
Adding (5) and (6), $21x = 420; \therefore x = 20$
Substituting 20 for x in (3), $20 + 2y = 52; \therefore y = 16$

30. $\frac{x}{3} - \frac{y}{9} = 2$ (1)

$\frac{x}{6} + \frac{y}{6} = 5$ (2)

Multiplying (1) by 9, $3x - y = 18$ (3)
Multiplying (2) by 6, $x + y = 30$ (4)
Adding (3) and (4), $4x = 48; \therefore x = 12$
Substituting 12 for x in (4), $12 + y = 30; \therefore y = 18$

31. $\frac{2x}{3} - \frac{3y}{4} = 6$ (1)

$\frac{3x}{4} - \frac{5y}{8} = 12$ (2)

Multiplying (1) by 12, $8x - 9y = 72$ (3)
Multiplying (2) by 8, $6x - 5y = 96$ (4)
Multiplying (3) by 5, $40x - 45y = 360$ (5)
Multiplying (4) by 9, $54x - 45y = 864$ (6)
Subtracting (5) from (6), $14x = 504$; $\therefore x = 36$
Substituting 36 for x in (4), $216 - 5y = 96$
Transposing, $216 - 96 = 5y$; $\therefore y = 24$

32. Let $x =$ the larger number
And $y =$ the smaller number
Then, $x + y = 14$ (1)
And $x - y = 8$ (2)
Adding, $2x = 22$; $\therefore x = 11$, the larger number
Substituting 11 for x in (1), $11 + y = 14$; $\therefore y = 3$, the smaller number

33. Let $x =$ the first number
And $y =$ the second number
Then, $2x + 3y = 34$ (1)
And $2x + 5y = 50$ (2)
Subtracting (1) from (2), $2y = 16$; $\therefore y = 8$, the second number
Substituting 8 for y in (1), $2x + 24 = 34$; $\therefore x = 5$, the first number

34. Let $x =$ the first number
And $y =$ the second number
Then, $x + y = 18$ (1)
And $x + 2y = 20$ (2)
Subtracting (1) from (2), $y = 2$, the second number
Substituting 2 for y in (1), $x + 2 = 18$; $\therefore x = 16$, the first number

35. Let $x =$ the number of cents per box of raspberries
And $y =$ the number of cents per box of cherries
Then, $2x + 3y = 54$ (1)
And $3x + 2y = 56$ (2)
Multiplying (1) by 3, $6x + 9y = 162$ (3)
Multiplying (2) by 2, $6x + 4y = 112$ (4)
Subtracting (4) from (3), $5y = 50$; $\therefore y = 10$
Substituting 10 for y in (1), $2x + 30 = 54$; $\therefore x = 12$
Hence, raspberries were 12¢ per box, cherries 10¢ per box.

36. Let x = the number of 3-gr. capsules
And y = the number of 2-gr. capsules
Then, $x + y = 220$ (1)
And $3x + 2y = 500$ (2)
Multiplying (1) by 2, $2x + 2y = 440$ (3)
Subtracting (3) from (2), $x = 60$
Substituting 60 for x in (1), $60 + y = 220$; $\therefore y = 160$
Hence, there were 60 3-gr. capsules and 160 2-gr. capsules.

37. Let x = the number of glasses @ 5¢
And y = the number of glasses @ 10¢
Then, $x + y = 850$ (1)
And $5x + 10y = 5500$ (2)
Multiplying (1) by 5, $5x + 5y = 4250$ (3)
Subtracting (3) from (2), $5y = 1250$; $\therefore y = 250$, the number @ 10¢
Substituting 250 for y in (1), $x + 250 = 850$; $\therefore x = 600$, the number @ 5¢

38. Let x = the number @ 12¢
And y = the number @ 10¢
Then, $x + y = 36$ (1)
And $12x + 10y = 250 + 150$, or 400 (2)
Multiplying (1) by 10, $10x + 10y = 360$ (3)
Subtracting (3) from (2), $2x = 40$; $\therefore x = 20$, the number @ 12¢
Substituting 20 for x in (1), $20 + y = 36$; $\therefore y = 16$, the number @ 10¢

39. Let x = the number of 1-dollar bills
And y = the number of 2-dollars bills
Then, $x + y = 38$ (1)
And $x + 2y = 50$ (2)
Subtracting (1) from (2), $y = 12$, the number of 2-dollar bills
Substituting 12 for y in (1), $x + 12 = 38$; $\therefore x = 26$, the number of 1-dollar bills

Page 134

40. Let x = the number of cents for the first ten words
And y = the number of cents for each additional word
Then, $x + 5y = 40$ (1)
And $x + 12y = 54$ (2)
Subtracting (1) from (2), $7y = 14$; $\therefore y = 2$
Substituting 2 for y in (1), $x + 10 = 40$; $\therefore x = 30$
Hence, 10 words cost 30¢, and each additional word 2¢, or the rate is 30 – 2.

41. Let $x =$ the number of cents per basket, Delaware
And $y =$ the number of cents per basket, Whitestone
Then, $2x = 3y + 15$ (1)
And $3x = 6y - 45$ (2)
Multiplying (1) by 2, $4x = 6y + 30$ (3)
Subtracting (2) from (3), $x = 75$
Substituting 75 for x in (1), $150 = 3y + 15$
Transposing, $150 - 15 = 3y$; $\therefore y = 45$
Hence, Delaware peaches cost 75¢, and Whitestone, 45¢ per basket.

42. Let $x =$ the number of men
And $y =$ the number of women
Then, $x + y = 1000$ (1)
And $2.50x + 1.50y = 2340$ (2)
Multiplying (1) by 1.50, $1.50x + 1.50y = 1500$ (3)
Subtracting (3) from (2), $x = 840$
Substituting 840 for x in (1), $840 + y = 1000$; $\therefore y = 160$
Hence, there were 840 men and 160 women.

43. Let $x =$ the number for adults
And $y =$ the number for children
Then, $x + y = 300$ (1)
And $\frac{1}{2}x + \frac{1}{4}y = 100$ (2)
Multiplying (2) by 4, $2x + y = 400$ (3)
Subtracting (1) from (3), $x = 100$, for adults
Substituting 100 for x in (1), $100 + y = 300$; $\therefore y = 200$, for children

44. Let $x =$ the number of inches in length
And $y =$ the number of inches in width
Then, $x - y = 6$ (1)
And $2x + 2y = 60$ (2)
Multiplying (1) by 2, $2x - 2y = 12$ (3)
Adding (2) and (3), $4x = 72$; $\therefore x = 18$, the length in inches
Substituting 18 for x in (2), $36 + 2y = 60$; $\therefore y = 12$, the width in inches

45. Let $x =$ the number of months sea duty
And $y =$ the number of months shore duty
Then, $x + y = 12$ (1)
And $150x + 127\frac{1}{2}y = 1620$ (2)
Multiplying (2) by 2, $300x + 255y = 3240$ (3)
Multiplying (1) by 300, $300x + 300y = 3600$ (4)
Subtracting (3) from (4), $45y = 360$; $\therefore y = 8$
Substituting 8 for y in (1), $x + 8 = 12$; $\therefore x = 4$
Hence, he was 4 mo. on sea duty and 8 mo. on shore duty.

46. Let $x =$ the weight of a shaft in tons
And $y =$ the weight of a capital in tons
Then, $x + y = 94$ (1)
And $x - y = 74$ (2)
Adding (1) and (2), $2x = 168$; $\therefore x = 84$
Substituting 84 for x in (1), $84 + y = 94$; $\therefore y = 10$
Hence, a shaft weighed 84 T., a capital 10 T.

47. Let $x =$ the number of tickets to the grounds
And $y =$ the number of tickets to the grandstand
Then, $\frac{1}{2}x + \frac{1}{4}y = 700$ (1)
And $\frac{1}{2}x + 2\left(\frac{1}{4}y\right) = 800$
Or, $\frac{1}{2}x + \frac{1}{2}y = 800$ (2)
Subtracting (1) from (2), $\frac{1}{4}y = 100$; $\therefore y = 400$
Substituting 400 for y in (2), $\frac{1}{2}x + 200 = 800$; $\therefore x = 1200$
Hence, there were 1200 tickets to grounds and 400 to grandstand.

Page 138

24. April has 30 days = 30 × 24 hr., or 720 hr. ; hence, the number of times I must wind my watch = 720 ÷ 36, or 20 times.

25. 5 oscillations per second = 60 × 5, or 300, per minute = 60 × 300, or 18,000, per hour.

26. From the Ans. to Ex. 25, the balance wheel loses 18,000 − 17,985, or 15, oscillations per hour = 24 × 15, or 360, per day = 7 × 360, or 2520, per week; since [Ex. 25] 5 oscillations should be made per second, the loss of 2520 oscillations means the loss of 2520 ÷ 5, or 504, sec. = 8 min. 24 sec.

27. 100 pr. = 100 ÷ 12, or $8\frac{1}{3}$, doz. pr. ; $8\frac{1}{3}$ × 66¢ = $5.50, her earnings.

28. A bushel yields 56 × 4 oz., or 224 oz. = 224 ÷ 16, or 14 lb.

29. 5 da. 15 hr. = 120 hr. + 15 hr., or 135 hr. ; the number of dozen jars made per hour = 11,250 ÷ 135, or $83\frac{1}{3}$ doz.; then, the output per day = 24 × $83\frac{1}{3}$ doz., or 2000 doz. jars = 24,000 jars.

30. 312,500 great gross = 12 × 312,500, or 3,750,000 gross;
3,750,000 × 20¢ = $750,000, the value.

31. $\frac{3}{4} + \frac{1}{10} = \frac{17}{20}$; hence, $\frac{3}{20}$ is charcoal; $\frac{3}{20}$ of 2000 lb. = 300 lb. ; then, the number of bushels = 300 ÷ 15, or 20 bu.

32. 8028 gross = 12 × 8028, or 96,336 doz. = 12 × 96,336, or 1,156,032 single pens; 1,156,032 × $.789 = $912,109.248, or $912,109.25, the value.

33. 700 mi. = 700 × 5280 ft., or 3,696,000 ft.; 1 hr. = 60 × 60 sec., or 3600 sec.; then, 3,696,000 ft. ÷ 3600 = $1026\frac{2}{3}$ ft., the rate per second.

34. 1 hr. 15 min. 12 sec. = 60 min. + 15 min. + .2 min., or 75.2 min.;
13,912 stamps ÷ 75.2 = 185 stamps, the number canceled per minute.

35. 15 hr. 45 min. = 15.75 hr.; the rate per hour = 90 mi. ÷ 15.75 = 5.71+ mi., or 5.7 mi.

36. 1 mi. = 1760 yd.; $\frac{1}{2}$ of 1760 yd. = 880 yd., the rate per minute;
Then, the number of minutes = 1870 ÷ 880, or $2\frac{1}{8}$ min.

Page 139

37. 120 × 8 gal. = 960 gal., the amount of juice; the amount of concentrated juice = 960 × $\frac{3}{4}$ pt., or 720 pt. = 720 ÷ 2, or 360 qt. = 360 ÷ 4, or 90 gal.

Page 140

1. £420 = 420 × $4.8665 = $2043.93.

2. £24.75 = 24.75 × $4.8665 = $120.445875, or $120.45.

3. £56.125 = 56.125 × $4.8665 = $273.1323125, or $273.13.

4. 1800 fr. = 1800 × $.193 = $347.40.

5. 144.50 fr. = 144.50 × $.193 = $27.8885, or $27.89.

6. 850.75 M. = 850.75 × $.238 = $202.4785, or $202.48.

7. 36.25 lire = 36.25 × $.193 = $6.99625, or $7.00.

8. 49.80 pesetas = 49.80 × $.193 = $9.6114, or $9.61.

9. 2000 drachmas = 2000 × $.193 = $386.

10. £500 = 500 × $4.8665 = $2433.25;
1000 lire = 1000 × $.193 = $193.

Page 141

12.

	£	s.	d.
	8	3	4
12			4
20		3	.33+
	8	.1	67−

8.167 × $4.8665 = $39.74+.

13.

	£	s.	d.
	5	2	6
12			6
20		2	.5
	5	.1	25

5.125 × $4.8665 = $24.94+.

14.

	£	s.	d.
	7	6	9
12			9
20		6	.75
	7	.3	375

7.3375 × $4.8665 = $35.71−.

15.

$$\begin{array}{r|lll} & \pounds & \text{s.} & \text{d.} \\ & 12 & 7 & 7 \\ 12 & & & 7 \\ \hline 20 & & 7 & .58+ \\ \hline & 12 & .3 & 79+ \end{array}$$

12.379 × $4.8665 = $60.24+.

16.

$$\begin{array}{r|lll} & \pounds & \text{s.} & \text{d.} \\ & 25 & 4 & 3 \\ 12 & & & 3 \\ \hline 20 & & 4 & .25 \\ \hline & 25 & .2 & 125 \end{array}$$

25.2125 × $4.8665 = $122.70−.

17.

$$\begin{array}{r|lll} & \pounds & \text{s.} & \text{d.} \\ & 66 & 8 & 5 \\ 12 & & & 5 \\ \hline 20 & & 8 & .42- \\ \hline & 66 & .4 & 21- \end{array}$$

66.421 × $4.8665 = $323.24−.

18.

$$\begin{array}{r|lll} & \pounds & \text{s.} & \text{d.} \\ & 100 & 8 & 1\tfrac{1}{2} \\ 12 & & & 1\tfrac{1}{2} \\ \hline 20 & & 8 & .125 \\ \hline & 100 & .4 & 06 \end{array}$$

100.406 × $4.8665 = $488.63−.

19.

$$\begin{array}{r|lll} & \pounds & \text{s.} & \text{d.} \\ & 125 & 6 & 10 \\ 12 & & & 10 \\ \hline 20 & & 6 & .83+ \\ \hline & 125 & .3 & 42- \end{array}$$

125.342 × $4.8665 = $609.98−.

20.

$$\begin{array}{r|lll} & \pounds & \text{s.} & \text{d.} \\ & 440 & 18 & 9\tfrac{1}{2} \\ 12 & & & 9\tfrac{1}{2} \\ \hline 20 & & 18 & .79+ \\ \hline & 440 & .9 & 40- \end{array}$$

440.940 × $4.8665 = $2145.83+.

22. $1000 ÷ $4.8665 = 205.486+, the number of pounds; .486 × 20*s.* = 9.72*s.*, and .72 × 12*d.* = 8.64*d.*; hence, to the nearest penny, $1000 = £205 9*s.* 9*d.*

23. $3200 ÷ $4.8665 = 657.557−, the number of pounds; .557 × 20*s.* = 11.14*s.*, and .14 × 12*d.* = 1.68*d.*; hence, to the nearest penny, $3200 = £657 11*s.* 2*d.*

24. $5500 ÷ $4.8665 = 1130.176−, the number of pounds; .176 × 20*s.* = 3.52*s.*, and .52 × 12*d.* = 6.24*d.*; hence, to the nearest penny, $5500 = £1130 3*s.* 6*d.*

25. $48.25 ÷ $4.8665 = 9.915−, the number of pounds; .915 × 20*s.* = 18.3*s.*, and .3 × 12*d.* = 3.6*d.*; hence, to the nearest penny, $48.25 = £9 18*s.* 4*d.*

26. $62.75 ÷ $4.8665 = 12.894+, the number of pounds; .894 × 20*s.* = 17.88*s.*, and .88 × 12*d.* = 10.56*d.*; hence, to the nearest penny, $62.75 = £12 17*s.* 11*d.*

27. $90.10 ÷ $4.8665 = 18.514+, the number of pounds; .514 × 20*s.* = 10.28*s.*, and .28 × 12*d.* = 3.36*d.*; hence, to the nearest penny, $90.10 = £18 10*s.* 3*d.*

28. $77.14 ÷ $4.8665 = 15.851+, the number of pounds; .851 × 20*s.* = 17.02*s.*, and .02 × 12*d.* = .24*d.*; hence, to the nearest penny, $77.14 = £15 17*s.*

29. $84.40 ÷ $4.8665 = 17.343 +, the number of pounds; .343 × 20*s.* = 6.86*s.*, and .86 × 12*d.* = 10.32*d.*; hence, to the nearest penny, $84.40 = £17 6*s.* 10*d.*

30. $50.07 ÷ $4.8665 = 10.289^{-}, the number of pounds; .289 × 20*s.* = 5.78*s.*, and .78 × 12*d.* = 9.36*d.*; hence, to the nearest penny, $50.07 = £10 5*s.* 9*d.*

31. $122.43 ÷ $4.8665 = 25.158^{-}, the number of pounds; .158 × 20*s.* = 3.16*s.*, and .16 × 12*d.* = 1.92*d.*; hence, to the nearest penny, $122.43 = £25 3*s.* 2*d.*

32. $760.50 ÷ $4.8665 = 156.272^{+}, the number of pounds; .272 × 20*s.* = 5.44*s.*, and .44 × 12*d.* = 5.28*d.*; hence, to the nearest penny, $760.50 = £156 5*s.* 5*d.*

33. $325.85 ÷ $4.8665 = 66.958^{-}, the number of pounds; .958 × 20*s.* = 19.16*s.*, and .16 × 12*d.* = 1.92*d.*; hence, to the nearest penny, $325.85 = £66 19*s.* 2*d.*

34. 2 × £38,000 = £76,000, the cost of both; 76,000 × $4.8665 = $369,854.

35. He works 6 × 9 hr., or 54 hr., per week; he earns 54 × 10*d.*, or 540*d.*; 540*d.* = $\frac{540}{12}$*s.*, or 45*s.* = £$\frac{45}{20}$, or £2 5*s.*

Page 142

36. The Baldwins cost 15 × 3*d.*, or 45*d.*; the Newtowns cost 20 × 5*d.*, or 100*d.*; the whole cost = 45*d.* + 100*d.*, or 145*d.*; since 1 sovereign = 20 × 12*d.*, or 240*d.*, I received in change 240*d.* − 145*d.*, or 95*d.* = 7*s.* 11*d.*

37. Since £1 6*s.* = £$1\frac{6}{20}$, or £1.3, the cost of 12 tons = 12 × £1.3 = £15.6, or £15 12*s.*

The cost per ton in our money = 1.3 × $4.8665 = $6.326^{+}, or $6.33.

38. He sold 85 lb. + 84 lb. + 96 lb. = 265 lb.; he therefore received 265*d.*; 265*d.* = 22*s.* 1*d.* = £1 2*s.* 1*d.*

39. The fare for each = 194 × 2*d.* = 388*d.*; the fare for all = 3 × 388*d.* = 1164*d.*;

1164*d.* = 97*s.* = £4 17*s.*, the fare for all.
388*d.* = (388 ÷ 12)*s.*, or 32.33^{+}*s.* = £(32.33^{+} ÷ 20), or £1.617^{-};
£1.617 = 1.617 × $4.8665 = $7.87^{-}, the fare for each.

40. He worked 6 × 10 hr., or 60 hr., per week, and received 60 × 20 pf., or 1200 pf.;

1200 pf. = 12 M. = 12 × $.238, or $2.86^{-}, his earnings.

41. He buys 52 × 8 cups, or 416 cups, and expends 416 × 2 pf., or 832 pf. = 8 M. 32 pf.

42. 8 fr. 50 c. = $8\frac{1}{2}$ fr.; 3964 × $8\frac{1}{2}$ fr. = 33,694 fr., the toll paid.

43. The receipts in U.S. money = 103,120,268 × $.193 = $19,902,211.72+.

44. The fine in U.S. money = 5000 × $.238 = $1190.

45. £500 = 500 × $4.8665 = $2433.25;
Hence, the difference in cost = $2433.25 − $214.13 = $2219.12.

46. The cost = 2212 × £7779 = £17,207,148.
The cost in U.S. money = 17,207,148 × $4.8665 = $83,738,585.74+.

Page 146

12. The area = (42 × 60) sq. ft. = 2520 sq. ft.;
The value = 2520 × £75 = £189,000.

13. The cubic contents of the room = (16 × 13½ × 10) cu. ft. = 2160 cu. ft.;
The quantity of oxygen = ⅕ of 2160 cu. ft. = 432 cu. ft.

14. The area covered by each brick = (8¼ × 2) sq. in. = 16½ sq. in.;
The area of the street = (2310 × 30) sq. ft. = 69,300 sq. ft.;
69,300 sq. ft. = 69,300 × 144 sq. in. = 9,979,200 sq. in.; then,
9,979,200 sq. in. ÷ 16½ sq. in. = 604,800, the number of bricks.

15. 6 mi. 1980 ft. = 6 × 5280 ft. plus 1980 ft. = 33,660 sq. ft.;
The area of the road = (15 × 33,660) sq. ft. = 504,900 sq. ft.;
504,900 sq. ft. = (504,900 ÷ 9) sq. yd = 56,100 sq. yd.;
Hence, the cost = 56,100 × $.55 = $30,855.

16. 9 ft. = 3 yd.; the contents = (3 × 3 × 440) cu. yd. = 3960 cu. yd.;
Then, the number of pounds of powder = 3960 cu. yd. ÷ 3 cu. yd., or 1320 lb.

17. The cubic contents of the box = (4 × 2½ × 3) cu. ft. = 30 cu. ft.;
Then, the weight = 30 × 103⅛ lb. = 3093¾ lb.

18. The area of the floor = (62 × 36) sq. ft. = 2232 sq. ft.;
Then, the maximum load = 2232 × 250 lb. = 558,000 lb.

19. The number of erasers, end to end, in a row the long way of the block = 18 in. ÷ 2 in., or 9 erasers; the number of rows in one layer = 15 in. ÷ 1¼ in., or 12 rows; then, in one layer there are 12 × 9 erasers, or 108 erasers; the number of layers in the block = 9 in. ÷ ½ in., or 18 layers; hence, 18 × 108 erasers, or 1944 erasers, can be cut from the block.

20. 2 × ⅞ in. = 1¾ in., the width of the two side margins;
11¼ in. − 1¾ in. = 9½ in., the width of the illustration;
1¼ in. + 3¼ in. = 4½ in., the width of the top and bottom margins;
16¼ in. − 4½ in. = 11¾ in., the length of the illustration;
Then, the area of the illustration = (9½ × 11¾) sq. in. = 111⅝ sq. in.

21. The inside dimensions are, respectively: 22 in. – 1½ in., or 20½ in.; 19 in. – 1½ in., or 17½ in.; and 11 in. – 1½ in., or 9½ in. Hence, the cubic contents of the chest = (20½ × 17½ × 9½) cu. in. = 3408⅛ cu. in.

22. The area in acres = (216 × 160) sq. rd. ÷ 160 sq. rd., or 216 A.;
The number of days = 216 A. ÷ 24 A., or 9 days.

23. Let x = the number of feet the reaper must go
Since 1 A. = 43,560 sq. ft., $18x = 43{,}560$
Dividing by 18, $x = 2420$, the distance in feet.

Page 148

25.

ft.	in.
602	11
576	9
26	2, difference

26.

gal.	qt.	pt.
63	0	0
	2	1
62	1	1, remaining

27.

lb.	oz.
86	9
	95
8223	7, consumed

28.

	bu.	pk.
12)	94	2
	7	3½, the quantity per day

29.

gross	doz.
24	4
	9
219	, the quantity in 9 hr.

Page 149

30. Adding the several amounts given in the first half of the table, we get 3301 hr. 43 min., the time required by hand.

Adding the several amounts given in the second half of the table, we get 1375 hr. 56.3 min., the time required by machinery.

31.

hr.	min.
11	40
1	48
9	52, shrinking cloth

hr.	min.
33	20
4	32.5
28	47.5, cutting cloth

hr.	min.
1000	0
66	40
933	20, sewing seams

hr.	min.
3	20
	17.5
3	2.5, cutting buttonholes

hr.	min.	
275	0	
6	17.8	
268	42.2	, working buttonholes

hr.	min.	
1978	23	
1296	20.5	
682	2.5	, all others

Adding these six results, we get 1925 hr. 46.7 min., the total difference.

32. 15 hr. 32 min. + 19 hr. 58 min. + 17 hr. 15 min. + 18 hr. 12 min. = 70 hr. 57 min.

	hr.	min.	
4)	70	57	
	17	44¼	, the average time

33.

lb.	oz.	
21	14	
	124	
2712	8	, the total

34.

	lb.	oz.	
25)	21	14	
		14	, each packet

14 oz. ÷ 6 = 2⅓ oz., each candle

35.

A.	sq. rd.	
84	82.5	
16	147.5	
101	70	, the total

	A.	sq. rd.	
3)	101	70	
	33	130	, sold

A.	sq. rd.	
101	70	
33	130	
67	100	, remaining

36.

rd.	ft.	rd.	ft.	rd.	ft.	rd.	ft.	rd.	ft.	rd.	ft.
3	10½	4	14	7	4½	8	4	13	15½		10½
	28		2		21		12		13		6
101	13½	9	11½	152	12	98	15	181	3½	3	13½

Then, 101 rd. 13½ ft. + 9 rd. 11½ ft. + 152 rd. 12 ft. + 98 rd. 15 ft. + 181 rd. 3½ ft. + 9 rd. 1½ ft. + 9 rd. 6½ ft. + 3 rd. 13½ ft. = 1 mi. 246 rd. 11 ft., the length.

Page 152

2.

	77°	03′	06″	W., the longitude of Washington
	71°	03′	50″	W., the longitude of Boston
15)	5°	59′	16″.	the difference in longitude
		23′	57+″ ;	∴ 23 min. 57 sec. is the difference in time.

Since Boston is *east* of Washington, the time is *later* in Boston; that is, when it is noon at Washington it is 23 min. 57 sec. after noon at Boston.

3.

	77°	03′	06″	W., the longitude of Washington
	74°	00′	24″	W., the longitude of New York
15)	3°	2′	42″,	the difference in longitude
		12′	11−″ ;	∴ 12 min. 11 sec. is the difference in time.

Since New York is *east* of Washington, the time is *later* in New York; that is, when it is noon at Washington it is 12 min. 11 sec. after noon at New York.

4. 87° 36′ 45″ W., the longitude of Chicago
77° 03′ 06″ W., the longitude of Washington
15)10° 33′ 39″, the difference in longitude
42′ 15−″; ∴ 42 min. 15 sec. is the difference in time.

Since Chicago is *west* of Washington, the time is *earlier* in Chicago; that is, when it is noon at Washington it is 42 min. 15 sec. before noon at Chicago, or 17 min. 45 sec. after 11 A.M.

5. 77° 03′ 06″ W., the longitude of Washington
13° 23′ 44″ E., the longitude of Berlin
15)90° 26′ 50″, the difference in longitude
6° 1′ 47+″; ∴ 6 hr. 1 min. 47 sec. is the difference in time.

Since Berlin is *east* of Washington, the time is *later* in Berlin; that is, when it is noon at Washington it is 6 hr. 1 min. 47 sec. after noon at Berlin, or 1 min. 47 sec. after 6 P.M.

6. 77° 03′ 06″ W., the longitude of Washington
2° 20′ 14″ E., the longitude of Paris
15)79° 23′ 20″, the difference in longitude
5° 17′ 33+″; ∴ 5 hr. 17 min. 33 sec. is the difference in time.

Since Paris is *east* of Washington, the time is *later* in Paris; that is, when it is noon at Washington it is 5 hr. 17 min. 33 sec. after noon at Paris, or 17 min. 33 sec. after 5 P.M.

7. 15)77° 03′ 06″, the difference in longitude
5° 8′ 12+″; ∴ 5 hr. 8 min. 12 sec. is the difference in time.

Since London is *east* of Washington, the time is *later* in London; that is, when it is noon at Washington it is 5 hr. 8 min. 12 sec. after noon at London, or 8 min. 12 sec. after 5 P.M.

8. 77° 03′ 06″ W., the longitude of Washington
9° 58′ 25″ E., the longitude of Hamburg
15)87° 1′ 31″, the difference in longitude
5° 48′ 6+″; ∴ 5 hr. 48 min. 6 sec. is the difference in time.

Since Hamburg is *east* of Washington, the time is *later* in Hamburg; that is, when it is noon at Washington it is 5 hr. 48 min. 6 sec. after noon at Hamburg, or 48 min. 6 sec. after 5 P.M.

9. 77° 03′ 06″ W., the longitude of Washington
4° 53′ 04″ E., the longitude of Amsterdam
15)81° 56′ 10″, the difference in longitude
5° 27′ 45−″; ∴ 5 hr. 27 min. 45 sec. is the difference in time.

Since Amsterdam is *east* of Washington, the time is *later* in Amsterdam; that is, when it is noon at Washington it is 5 hr. 27 min. 45 sec. after noon at Amsterdam, or 27 min. 45 sec. after 5 P.M.

10. 77° 03′ 06″ W., the longitude of Washington
18° 28′ 40″ E., the longitude of Cape Town
15)95° 31′ 46″, the difference in longitude
6° 22′ 7+″; ∴ 6 hr. 22 min. 7 sec. is the difference in time.

Since Cape Town is *east* of Washington, the time is *later* in Cape Town; that is, when it is noon at Washington it is 6 hr. 22 min. 7 sec. after noon at Cape Town, or 22 min. 7 sec. after 6 P.M.

Page 153

12. hr. min.
2 21, diff. in time
15
35 15
35° 15′, diff. in longitude

77° 03′ 06′ W. (Wash.)
35° 15′
41° 48′ 06″ W.

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 41° 48′ 6″ W.

13. hr. min.
4 36, diff. in time
15
69 00
69° 00′, diff. in longitude

77° 03′ 06″ W. (Wash.)
69°
8° 03′ 06″ W.

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 8° 3′ 6″ W.

14. hr. min.
3 42, diff. in time
15
55 30
55° 30′, diff. in longitude

77° 03′ 06″ W. (Wash.)
55° 30′
21° 33′ 06″ W.

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 21° 33′ 6″ W.

15. hr. min.
1 42, diff. in time
15
25 30
25° 30′, diff. in longitude

77° 03′ 06″ W. (Wash.)
25° 30′
102° 33′ 06″ W.

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 102° 33′ 6″ W.

16.

hr. min.	
2 6, diff. in time	77° 03′ 06″ W. (Wash.)
15	31° 30′
31 30	108° 33′ 06″ W.
31° 30′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 108° 33′ 6″ W.

17.

hr. min.	
5 51, diff. in time	77° 03′ 06″ W. (Wash.)
15	87° 45′
87 45	164° 48′ 06″ W.
87° 45′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 164° 48′ 6″ W.

18.

hr. min.	
4 27½, diff. in time	77° 03′ 06″ W. (Wash.)
15	66° 52′ 30″
66 52½	143° 55′ 36″ W.
66° 52½′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 143° 55′ 36″ W.

19.

hr. min.	
1 5¾, diff. in time	77° 03′ 06″ W. (Wash.)
15	16° 26′ 15″
16 26¼	60° 36′ 51″ W.
16° 26¼′, diff. in longitude	

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 60° 36′ 51″ W.

20.

hr. min. sec.	
4 00 15, diff. in time	77° 03′ 06″ W. (Wash.)
15	60° 03′ 45″
60 03 45	137° 06′ 51″ W.
60° 03′ 45″, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 137° 6′ 51″ W.

21. 72° 4′ 0″ W., the longitude of Norwich, Conn.
1° 18′ 0″ W., the longitude of Norwich, Eng.
15)70° 46′ 0″, the difference in longitude
4° 43′ 4″; ∴ 4 hr. 43 min. 4 sec. is the difference in time,
and the sun crosses the meridian of Norwich, Conn., 4 hr. 43 min. 4 sec. later.

22. 87° 36′ 45″ W. (Chic.)	104° 58′ 00″ W. (Den.)
71° 03′ 50″ W. (Bost.)	71° 03′ 50″ W. (Bost.)
15)16° 32′ 55″, diff.	15)33° 54′ 10″, diff.
1° 6′ 12 - ″	2° 15′ 37 - ″
1 hr. 6 min. 12 sec., diff. in time.	2 hr. 15 min. 37 sec., diff. in time.

122° 24′ 32″ W. (San F.)
71° 03′ 50″ W. (Bost.)
15) 51° 20′ 42″, diff.
3° 25′ 23 - ″

3 hr. 25 min. 23 sec., diff. in time.

Since Chicago, Denver, and San Francisco are *west* of Boston, the time of each is *earlier* than that of Boston; that is, when it is 1:13 A.M. at Boston, it is 6 min. 48 sec. after midnight at Chicago, 57 min. 28 sec. after 10 P.M., day before, at Denver, and 47 min. 37 sec. after 9 P.M., day before, at San Francisco.

23. 71° 03′ 50″ W. (Bost.)	94° 47′ 26″ W. (Gal.)
2° 20′ 14″ E. (Paris)	71° 03′ 50″ W. (Bost.)
15)73° 24′ 4″, diff.	15)23° 43′ 36″, diff.
4° 53′ 36 + ″	1° 34′ 54 + ″
4 hr. 53 min. 36 sec., diff. in time.	1 hr. 34 min. 54 sec., diff. in time.

Hence, Parisians had been living 4 hr. 53 min. 36 sec. in the twentieth century; for the people of Galveston, 1 hr. 34 min. 54 sec. still remained.

Page 154

24. 1 hr. 5 min.
15
16 hr. 15 min.
16° 15′, diff. in longitude.

Since the time of the ship is *earlier* than that of Greenwich, the ship is *west* of Greenwich, hence, it is in longitude 16° 15′ W.

25. Since on Saturday noon the ship's time was *later* than Greenwich time the ship was *east* of Greenwich; the distance east in degrees and minutes is the same as the number of hours and minutes in 15 × 35 min. = 8 hr. 45 min. The ship was therefore in longitude 8° 45′ E.

Since on Tuesday noon the ship's time was *earlier* than Greenwich time, the ship was *west* of Greenwich; the distance west in degrees and minutes is the

same as the number of hours and minutes in 15 × 13 min. = 3 hr. 15 min. The ship was therefore in longitude 3° 15′ W.

Since the ship sailed from 8° 45′ E. to 3° 15′ W., she sailed 12° west.

27.
74° 00′ 24″ W. (N.Y.)
120° 58′ 06″ E. (Man.)
15)194° 58′ 30″, diff.
12° 59′ 54″
12 hr. 59 min. 54 sec.,
diff. in time.

Since Manila is *east* from New York, the time of Manila is *later* than that of New York; that is, when it is noon in New York, May 1, it is 59 min. 54 sec. after midnight, May 2, in Manila.

28.
74° 00′ 24″ W. (N.Y.)
106° 48′ 37″ E. (Bat.)
15)180° 49′ 1″, diff.
12° 3 16+″
12 hr. 3 min. 16 sec.,
diff. in time.

Since Batavia is *east* from New York, the time of Batavia is *later* than that of New York; that is, when it is noon in New York, May 1, it is 3 min. 16 sec. after midnight, May 2, in Batavia.

29.
74° 00′ 24″ W. (N.Y.)
113° 16′ 30″ E. (Can.)
15)187° 16′ 54″, diff.
12° 29′ 8−″
12 hr. 29 min. 8 sec.,
diff. in time.

Since Canton is *east* from New York, the time of Canton is *later* than that of New York; that is, when it is noon in New York, May 1, it is 29 min. 8 sec. after midnight, May 2, in Canton.

30.
74° 00′ 24″ W. (N.Y.)
144° 58′ 35″ E. (Mel.)
15)218° 58′ 59″, diff.
14° 35′ 56−″
14 hr. 35 min. 56 sec.,
diff. in time.

Since Melbourne is *east* from New York, the time of Melbourne is *later* than that of New York; that is, when it is noon in New York, May 1, it is 35 min. 56 sec. after 2 A.M., May 2, in Melbourne.

31.
74° 00′ 24″ W. (N.Y.)
72° 48′ 56″ E. (Bom.)
15)146° 49′ 20″, diff.
9° 47′ 17+″
9 hr. 47 min. 17 sec.,
diff. in time.

Since Bombay is *east* from New York, the time of Bombay is *later* than that of New York; that is, when it is noon in New York, May 1, it is 47 min. 17 sec. after 9 P.M., May 1, in Bombay.

32.
74° 00′ 24″ W. (N.Y.)
18° 28′ 40″ E. (C.T.)
15)92° 29′ 4″, diff.
6° 9′ 56+″
6 hr. 9 min. 56 sec.,
diff. in time.

Since Cape Town is *east* from New York, the time of Cape Town is *later* than that of New York; that is, when it is noon in New York, May 1, it is 9 min. 56 sec. after 6 P.M., May 1, in Cape Town.

33. 114° 10′ 02″ E. (H.-K.)   360° 0′ 0″
157° 51′ 34″ W. (Hon.)   272° 1′ 36″
272° 1′ 36″   15) 87° 58′ 24 ′, diff. in longitude
5° 51′ 54−″; 5 hr. 51 min. 54 sec., diff. in time.

Since Hong-Kong is 87° 58′ 24″ *west* of Honolulu, its time is 5 hr. 51 min. 54 sec. *earlier* than that of Honolulu; that is, when it is noon at Honolulu, it is 5 hr. 51 min. 54 sec. before noon at Hong-Kong. From noon, March 10 (Hong-Kong time), to noon, March 25 (Honolulu time), is 15 days less 5 hr. 51 min. 54 sec., or 14 da. 18 hr. 8 min. 6 sec. But this is 1 day short of the actual time, inasmuch as the calendar is set back a day in sailing eastward over the 180th meridian. Therefore, the actual time of the voyage was 15 da. 18 hr. 8 min. 6 sec.

Page 156

1. Since New York (75° W.) is *east* of Chicago (90° W.), its time is 1 hr. *later* than that of Chicago; hence, when it is 10:30 A.M. in Chicago, it is 11:30 A.M. in New York.

Since New Orleans (90° W.) and San Antonio (90° W.) have the same time as Chicago (90° W.), they received the message at 10:30 A.M.

Since Portland, Ore. (120° W.), is *west* of Chicago (90° W.), its time is 2 hr. *earlier* than that of Chicago; hence, when it is 10:30 A.M. in Chicago, it is 8:30 A.M. in Portland.

2. Since Salt Lake City (105° W.) is *west* of St. Louis (90° W.), its time is 1 hr. *earlier* than that of St. Louis; hence, when it is 12:15 P.M. in St. Louis, it is 11:15 A.M. in Salt Lake City.

Since Portland, Me. (75° W.), is *east* of St. Louis (90° W.), its time is 1 hr. *later* than that of St. Louis; hence, when it is 12:15 P.M. in St. Louis, it is 1:15 P.M. in Portland.

Since Manila (120° E.) is *east* of St. Louis (90° W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 120°, or 210°, which makes a time difference of (210 ÷ 15), or 14, hr. Hence, when it is 12:15 P.M. in St. Louis, it is 2:15 A.M. (next day) in Manila.

Since Bombay (75° E.) is *east* of St. Louis (90° W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 75°, or 165°, which makes a time difference of (165 ÷ 15), or 11, hr. Hence, when it is 12:15 P.M. in St. Louis, it is 11:15 P.M. in Bombay.

Since Berlin (15° E.) is *east* of St. Louis (90 W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 15°, or 105°, which makes a time difference of (105 ÷ 15), or 7, hr. Hence, when it is 12:15 P.M. in St. Louis, it is 7:15 P.M. in Berlin.

Since London (0°) is *east* of St. Louis (90° W.), its time is 6 hr. *later* than that of St. Louis ; that is, when it is 12 : 15 P.M. in St. Louis, it is 6 : 15 P.M. in London.

Since Tokyo (135° E.) is *east* of St. Louis (90° W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 135°, or 225°, which makes a time difference of (225 ÷ 15), or 15, hr. Hence, when it is 12 : 15 P.M. in St. Louis, it is 3.15 A.M. (next day) in Tokyo.

3. Since Madrid (0°) is *east* of Havana (75° W.), its time is 5 hr. *later* than that of Havana ; hence, when it is 2 A.M. in Havana, it is 7 A.M. in Madrid.

4. Since Washington (75° W.) is *west* of Manila (120° E.), its time is *earlier* than that of Manila. The difference between their meridians is 75° + 120°, or 195°, which makes a time difference of (195 ÷ 15), or 13, hr. Hence, the time from 5 : 41 A.M. to 7 : 40 A.M., May 1, in Manila, is the same as the time from 4 : 41 P.M. to 6 : 40 P.M., Apr. 30, in Washington.

5. Since Manila (120° E.) is *east* of Madrid (0°), its time is 8 hr. *later* than that of Madrid ; that is, when it is 6 : 20 P.M. in Madrid, it is 2 : 20 A.M. (next day) in Manila. As the *Olympia* opened fire at 5 : 41 A.M. [Ex. 4], the news therefore reached Madrid 20 hr. 39 min. later.

Page 157

6. Since Manila (120° E.) is *east* of London (0°), its time is 8 hr. *later* than that of London ; hence, when it is 10 A.M. in London, it is 6 P.M. in Manila.

7. Since Cairo (30° E.) is *east* of London (0°), its time is 2 hr. *later* than that of London ; hence, when it is 3 : 15 P.M. in London, it is 5 : 15 P.M. in Cairo.

8. Since New York (75° W.) is *west* of London (0°), its time is 5 hr. *earlier* than that of London ; hence, when it is 1¼ hr. later than 3 : 15 P.M., or 4 : 30 P.M., in London [Ex. 7], it is 11 : 30 A.M. in New York.

9. Since Washington (75° W.) is *east* of San Francisco (120° W.), its time is 3 hr. *later* than that of San Francisco ; that is, when it is 5 : 12 A.M. in San Francisco, it is 8 : 12 A.M. in Washington. Hence, it took the shock 7 min. 20 sec. to reach Washington.

10. Since Tokyo (135° E.) is *east* of Port Arthur (120° E.), its time is 1 hr. *later* than that of Port Arthur ; hence, when it is 10 P.M., Jan. 2, in Port Arthur, it is 11 P.M., Jan. 2, in Tokyo.

Since St. Petersburg (30° E.) and London (0°) are *west* of Port Arthur (120° E.), their times are respectively 6 hr. and 8 hr. *earlier* than that of Port Arthur ; hence, when it is 10 P.M., Jan. 2, in Port Arthur, it is 4 P.M., Jan. 2, in St. Petersburg, and 2 P.M., Jan. 2, in London.

Since New York (75° W.) is *west* of Port Arthur (120° E.), its time is *earlier* than that of Port Arthur. The difference between their meridians is 75° + 120°, or 195°, which makes a time difference of (195 ÷ 15), or 13, hr. Hence, when it is 10 P.M., Jan. 2, in Port Arthur, it is 9 A.M., Jan. 2, in New York.

11. The time from 12:15 P.M., May 17, to 9:18 P.M., May 29, is 12 da. 9 hr. 3 min.; but since the Lizard (0°) is *east* of Sandy Hook (75° W.), its time is 5 hr. *later* than that of Sandy Hook. Hence, the true time of the *Atlantic* was 12 da. 9 hr. 3 min. less 5 hr., or 12 da. 4 hr. 3 min.

12\.

$$\begin{array}{r} 15)\underline{21^\circ\quad 0'} \\ 1^\circ\quad 24' \end{array}$$

1 hr. 24 min.,
diff. in time.

The vessel began pumping 5 hr. before 2:27 P.M., or 9:27 A.M., Greenwich time; since the vessel is *west* of Greenwich, her true time is 1 hr. 24 min. *earlier* than that of Greenwich; hence the pumps began working at 8:03 A.M.

13\.

$$\begin{array}{rrrl} & 75^\circ & 0' & 0''\ \text{W. (N.Y.)} \\ & \underline{2^\circ} & \underline{20'} & \underline{14''}\ \text{E. (Paris)} \\ 15) & \underline{77^\circ} & \underline{20'} & \underline{14''},\ \text{diff.} \\ & 5^\circ & 9' & 21^{-''} \end{array}$$

5 hr. 9 min. 21 sec.,
diff. in time.

Since New York, which takes its time from the 75th meridian, is *west* of Paris, its time is *earlier* than that of Paris; hence, when it is 3 P.M. in Paris, it is 50 min. 39 sec. after 9 A.M. in New York.

14. Since Chicago (90° W.), Denver (105° W.), and San Francisco (120° W.), are *west* of Washington (75° W.), their times are respectively 1 hr., 2 hr., and 3 hr. *earlier* than that of Washington; hence, when it was 12 P.M., Dec. 31, '04, in Washington, it was 11 P.M., Dec. 31, '04, in Chicago; 10 P.M., Dec. 31, '04, in Denver; and 9 P.M., Dec. 31, '04, in San Francisco.

Considering Manila (120° E.), Tokyo (135° E.), Melbourne (150° E.), Bombay (75° E.), Berlin (15° E.), and London (0°), as east of Washington (75° W.), their times are *later* than that of Washington. Following is the difference between the meridian of Washington and that of each of these cities, the consequent difference in time, and the date and time in each city when it was 12 P.M., Dec. 31, '04, in Washington.

CITY	DIFF. IN LONGITUDE	DIFF. IN TIME	DATE AND TIME
Manila	75° + 120° = 195°	195 ÷ 15 = 13 hr.	Jan. 1, '05, 1 P.M.
Tokyo	75° + 135° = 210°	210 ÷ 15 = 14 hr.	Jan. 1, '05, 2 P.M.
Melbourne	75° + 150° = 225°	225 ÷ 15 = 15 hr.	Jan. 1, '05, 3 P.M.
Bombay	75° + 75° = 150°	150 ÷ 15 = 10 hr.	Jan. 1, '05, 10 A.M.
Berlin	75° + 15° = 90°	90 ÷ 15 = 6 hr.	Jan. 1, '05, 6 A.M.
London	75°	75 ÷ 15 = 5 hr.	Jan. 1, '05, 5 A.M.

Page 144

1. The volume of the book [illegible]

2. The capacity of the chest [illegible]

3. The quantity of water required [illegible] 1000 cu. cm.

4. Since 1 Km. = 1000 m., the solid contents of the wall = (1000 × 1 × 1.6) cu. m. = 1600 cu. m.

5. Since the volume, 1 cu. cm., is the product of the three dimensions expressed in centimeters, the value of the missing dimension may be found by dividing 1 by (40 × 15); hence, the third dimension is $\frac{1}{600}$ cm.; that is, the gold must be beaten until it is $\frac{1}{600}$ cm., or $\frac{1}{60}$ mm., in thickness.

6. The volume of the block = (4 × 1.25 × 1.25) cu. m. = 6.25 cu. m.;
The value of the marble = 6.25 × $28 = $175.

7. Since 1 cu. Hm. = 1000 cu. Dm., and 1 cu. Dm. = 1000 cu. m., 1 cu. Hm. = 1,000,000 cu. m.; therefore, 320 cu. Hm. = 320,000,000 cu. m., the amount of gas produced.

8. Since 3.05 m. = 305 cm., the volume of such a timber = (61 × 61 × 305) cu. cm. = 1,134,905 cu. cm.

Page 164

1. The capacity of the box = (60 × 50 × 40) cu. cm. = 120,000 cu. cm.;
Hence, the box will hold 120,000 cu. cm., or 120 l., of rice.

2. 200 l. = 2 Hl.; since 2 Hl. of corn cost $12, 24 Hl. cost $\frac{24}{2}$ × $12 = $144.

3. The cost = 400 × $.25, or $100; at 30¢ per $\frac{3}{4}$ liter, the oil sold for $\frac{4}{3}$ × 30¢, or 40¢, per liter, and 400 liters sold for 400 × $.40 = $160. Hence, the gain = $160 − $100 = $60.

4. The yield per hektare = 110½ million Hl. ÷ 6½ million = 17 Hl.

Page 165

5. The total yield of olives = 750 × 30 l. = 22,500 l., or 225 Hl.

6. Since 1000 l. = 1 cu. m., 350 l. = .35 cu. m.; then, 1 engine throws 60 × .35 cu. m., or 21 cu. m., per minute, and 60 × 21 cu. m., or 1260 cu. m., per hour; and 4 engines throw 4 × 1260 cu. m., or 5040 cu. m., of water per hour.

Page 167

1. 142 m. = 142 × 39.37 in., or 5590.54 in. = (5590.54 ÷ 12) ft., or 465.878⅓ ft.; hence, the height of the spire = 465.878 ft.

2. 139.5 m. = 139.5 × 39.37 in., or 5492.115 in. = (5492.115 ÷ 12) ft., or 457.676¼ ft.; hence, the height of the pyramid = 457.676 ft.

3. 54.5 m. = 54.5 × 39.37 in., or 2145.665 in. = (2145.665 ÷ 12) ft., or 178.805^{+} ft.; hence, the height of the Leaning Tower = 178.805 ft.

4. 203 m. = 203 × 39.37 in., or 7992.11 in. = (7992.11 ÷ 12) ft., or 666.009^{+} ft.; hence, the height of "203-meter Hill" = 666.009 ft.

5. 14.9 Km. = 14.9 × .62137 mi., or 9.258413 mi.; hence, the length of the St. Gothard tunnel = 9.258 mi.

6. 78 Km. = 78 × .62137 mi., or 48.46686 mi.; hence, the length of the Panama Railroad = 48.467 mi.

7. 5318.9 Km. = 5318.9 × .62137 mi., or 3305.004893 mi.; hence, the length of the cable = 3305.005 mi.

8. 23 cm. = .23 m. = .23 × 39.37 in., or 9.0551 in.; hence, the length of the hairspring = 9.055 in.

9. 7 mm. = .007 m. = .007 × 39.37 in. = .27559 in.; hence, the bore of a Mauser rifle = .276 in.

10. On a street 12 m. wide the height of the walls may be 12 m. + 6 m., or 18 m. = 18 × 39.37 in., or 708.66 in. = (708.66 ÷ 12) ft., or 59.055 ft.

On a street 18 m. wide the height of the walls may be 20 m. = 20 × 39.37 in., or 787.4 in. = (787.4 ÷ 12) ft., or 65.617⁻ ft.

11. Since 39.37 in. = 1 m., 9 ft. 2 in., or 110 in., is equal to as many meters as 39.37 is contained times in 110; that is, 110 ÷ 39.37, or 2.794+; hence, the ceilings must be at least 2.794 m. high.

12. Since 1 a. = 1 sq. Dm., 100 a., or 1 Ha. = 1 sq. Hm., and 100 Ha. = 100 sq. Hm., or 1 sq. Km.; hence, 600,000 Ha. = 6000 sq. Km., the area in Portugal; 300,000 Ha. = 3000 sq. Km., the area in Spain; and 80,000 Ha. = 800 sq. Km., the area in Italy.

13. The shipment contained 1000 × 12½ Kg. = 12,500 Kg. = 12.5 M.T.

14. The amount of rock removed = (1278 × 3.65 × 3) cu. m. = 13,994.1 cu. m.

Page 168

15. The total amount removed = 12 × 4500 cu. m. = 54,000 cu. m.;
The cost = 54,000 × 3 pf., or 162,000 pf. = 1620 M.

16. The total quantity of cotton = 5.5 × 3 M.T., or 16.5 M.T. = 165 Q.;
The value of the cotton = 165 × $9.25 = $1526.25.

17. At 5¢ per 15 g. the postage cost $\frac{135}{15}$ × 5¢ = 45¢.

18. $\frac{1}{5}$ of 800 g. = 160 g., husk; 800 g. – 160 g. = 640 g., marketable coffee.

19. 2541.35 Kg. = 2541.35 × 32.1507 oz., or 81,706.181445 oz.; hence, to the nearest thousandth, the output of gold = 81,706.181 oz.

21. 1 cu. cm. of water weighs 1 g.; 1 cu. cm. of olive oil weighs 36.6 g. ÷ 40, or .915 g.; therefore, the specific gravity of olive oil is .915.

22. 1 l. of water weighs 1 Kg.; 1 l. of mercury weighs 2 × 6.799 Kg., or 13.598 Kg.; therefore, the specific gravity of mercury is 13.598.

4. 87° 36′ 45″ W., the longitude of Chicago
77° 03′ 06″ W., the longitude of Washington
15)10° 33′ 39″, the difference in longitude
42′ 15−″; ∴ 42 min. 15 sec. is the difference in time.

Since Chicago is *west* of Washington, the time is *earlier* in Chicago; that is, when it is noon at Washington it is 42 min. 15 sec. before noon at Chicago, or 17 min. 45 sec. after 11 A.M.

5. 77° 03′ 06″ W., the longitude of Washington
13° 23′ 44″ E., the longitude of Berlin
15)90° 26′ 50″, the difference in longitude
6° 1′ 47+″; ∴ 6 hr. 1 min. 47 sec. is the difference in time.

Since Berlin is *east* of Washington, the time is *later* in Berlin; that is, when it is noon at Washington it is 6 hr. 1 min. 47 sec. after noon at Berlin, or 1 min. 47 sec. after 6 P.M.

6. 77° 03′ 06″ W., the longitude of Washington
2° 20′ 14″ E., the longitude of Paris
15)79° 23′ 20″, the difference in longitude
5° 17′ 33+″; ∴ 5 hr. 17 min. 33 sec. is the difference in time.

Since Paris is *east* of Washington, the time is *later* in Paris; that is, when it is noon at Washington it is 5 hr. 17 min. 33 sec. after noon at Paris, or 17 min. 33 sec. after 5 P.M.

7. 15)77° 03′ 06″, the difference in longitude
5° 8′ 12+″; ∴ 5 hr. 8 min. 12 sec. is the difference in time.

Since London is *east* of Washington, the time is *later* in London; that is, when it is noon at Washington it is 5 hr. 8 min. 12 sec. after noon at London, or 8 min. 12 sec. after 5 P.M.

8. 77° 03′ 06″ W., the longitude of Washington
9° 58′ 25″ E., the longitude of Hamburg
15)87° 1′ 31″, the difference in longitude
5° 48′ 6+″; ∴ 5 hr. 48 min. 6 sec. is the difference in time.

Since Hamburg is *east* of Washington, the time is *later* in Hamburg; that is, when it is noon at Washington it is 5 hr. 48 min. 6 sec. after noon at Hamburg, or 48 min. 6 sec. after 5 P.M.

9. 77° 03′ 06″ W., the longitude of Washington
4° 53′ 04″ E., the longitude of Amsterdam
15)81° 56′ 10″, the difference in longitude
5° 27′ 45−″; ∴ 5 hr. 27 min. 45 sec. is the difference in time.

Since Amsterdam is *east* of Washington, the time is *later* in Amsterdam; that is, when it is noon at Washington it is 5 hr. 27 min. 45 sec. after noon at Amsterdam, or 27 min. 45 sec. after 5 P.M.

10.

	77° 03′ 06″	W., the longitude of Washington
	18° 28′ 40″	E., the longitude of Cape Town
15)	95° 31′ 46″,	the difference in longitude
	6° 22′ 7+″;	∴ 6 hr. 22 min. 7 sec. is the difference in time.

Since Cape Town is *east* of Washington, the time is *later* in Cape Town; that is, when it is noon at Washington it is 6 hr. 22 min. 7 sec. after noon at Cape Town, or 22 min. 7 sec. after 6 P.M.

Page 153

12. hr. min.

2 21, diff. in time	77° 03′ 06 ′ W. (Wash.)
15	35° 15′
35 15	41° 48′ 06″ W.
35° 15′, diff. in longitude	

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 41° 48′ 6″ W.

13. hr. min.

4 36, diff. in time	77° 03′ 06″ W. (Wash.)
15	69°
69 00	8° 03′ 06″ W.
69° 00′, diff. in longitude	

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 8° 3′ 6″ W.

14. hr. min.

3 42, diff. in time	77° 03′ 06″ W. (Wash.)
15	55° 30′
55 30	21° 33′ 06″ W.
55° 30′, diff. in longitude	

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 21° 33′ 6″ W.

15. hr. min.

1 42, diff. in time	77° 03′ 06″ W. (Wash.)
15	25° 30′
25 30	102° 33′ 06″ W.
25° 30′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 102° 33′ 6″ W.

16. hr. min.

$$\begin{array}{rrl}
2 & 6, & \text{diff. in time}\\
 & 15 & \\ \cline{1-2}
31 & 30 &
\end{array}
\qquad
\begin{array}{rrrl}
77^\circ & 03' & 06'' & \text{W. (Wash.)}\\
31^\circ & 30' & & \\ \cline{1-3}
108^\circ & 33' & 06'' & \text{W.}
\end{array}$$

31° 30′, diff. in longitude

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 108° 33′ 6″ W.

17. hr. min.

$$\begin{array}{rrl}
5 & 51, & \text{diff. in time}\\
 & 15 & \\ \cline{1-2}
87 & 45 &
\end{array}
\qquad
\begin{array}{rrrl}
77^\circ & 03' & 06'' & \text{W. (Wash.)}\\
87^\circ & 45' & & \\ \cline{1-3}
164^\circ & 48' & 06'' & \text{W.}
\end{array}$$

87° 45′, diff. in longitude

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 164° 48′ 6″ W.

18. hr. min.

$$\begin{array}{rrl}
4 & 27\frac{1}{2}, & \text{diff. in time}\\
 & 15 & \\ \cline{1-2}
66 & 52\frac{1}{2} &
\end{array}
\qquad
\begin{array}{rrrl}
77^\circ & 03' & 06'' & \text{W. (Wash.)}\\
66^\circ & 52' & 30'' & \\ \cline{1-3}
143^\circ & 55' & 36'' & \text{W.}
\end{array}$$

66° $52\frac{1}{2}'$, diff. in longitude

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 143° 55′ 36″ W.

19. hr. min.

$$\begin{array}{rrl}
1 & 5\frac{3}{4}, & \text{diff. in time}\\
 & 15 & \\ \cline{1-2}
16 & 26\frac{1}{4} &
\end{array}
\qquad
\begin{array}{rrrl}
77^\circ & 03' & 06'' & \text{W. (Wash.)}\\
16^\circ & 26' & 15'' & \\ \cline{1-3}
60^\circ & 36' & 51'' & \text{W.}
\end{array}$$

16° $26\frac{1}{4}'$, diff. in longitude

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 60° 36′ 51″ W.

20. hr. min. sec.

$$\begin{array}{rrrl}
4 & 00 & 15, & \text{diff. in time}\\
 & & 15 & \\ \cline{1-3}
60 & 03 & 45 &
\end{array}
\qquad
\begin{array}{rrrl}
77^\circ & 03' & 06'' & \text{W. (Wash.)}\\
60^\circ & 03' & 45'' & \\ \cline{1-3}
137^\circ & 06' & 51'' & \text{W.}
\end{array}$$

60° 03′ 45″, diff. in longitude

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 137° 6′ 51″ W.

21. 72° 4′ 0″ W., the longitude of Norwich, Conn.
1° 18′ 0″ W., the longitude of Norwich, Eng.
15)70° 46′ 0″, the difference in longitude
4° 43′ 4″; ∴ 4 hr. 43 min. 4 sec. is the difference in time,

and the sun crosses the meridian of Norwich, Conn., 4 hr. 43 min. 4 sec. later.

22. 87° 36′ 45″ W. (Chic.)	104° 58′ 00″ W. (Den.)
71° 03′ 50″ W. (Bost.)	71° 03′ 50″ W. (Bost.)
15)16° 32′ 55″, diff.	15)33° 54′ 10″, diff.
1° 6′ 12-″	2° 15′ 37-″
1 hr. 6 min. 12 sec., diff. in time.	2 hr. 15 min. 37 sec., diff. in time.

122° 24′ 32″ W. (San F.)
71° 03′ 50″ W. (Bost.)
15) 51° 20′ 42″, diff.
3° 25′ 23-″

3 hr. 25 min. 23 sec., diff. in time.

Since Chicago, Denver, and San Francisco are *west* of Boston, the time of each is *earlier* than that of Boston; that is, when it is 1:13 A.M. at Boston, it is 6 min. 48 sec. after midnight at Chicago, 57 min. 23 sec. after 10 P.M., day before, at Denver, and 47 min. 37 sec. after 9 P.M., day before, at San Francisco.

23. 71° 03′ 50″ W. (Bost.)	94° 47′ 26″ W. (Gal.)
2° 20′ 14″ E. (Paris)	71° 03′ 50″ W. (Bost.)
15)73° 24′ 4″, diff.	15)23° 43′ 36″, diff.
4° 53′ 36+″	1° 34′ 54+″
4 hr. 53 min. 36 sec., diff. in time.	1 hr. 34 min. 54 sec., diff. in time.

Hence, Parisians had been living 4 hr. 53 min. 36 sec. in the twentieth century; for the people of Galveston, 1 hr. 34 min. 54 sec. still remained.

Page 154

24. 1 hr. 5 min.
15
16 hr. 15 min.
16° 15′, diff. in longitude.

Since the time of the ship is *earlier* than that of Greenwich, the ship is *west* of Greenwich; hence, it is in longitude 16° 15′ W.

25. Since on Saturday noon the ship's time was *later* than Greenwich time, the ship was *east* of Greenwich; the distance east in degrees and minutes is the same as the number of hours and minutes in 15 × 35 min. = 8 hr. 45 min. The ship was therefore in longitude 8° 45′ E.

Since on Tuesday noon the ship's time was *earlier* than Greenwich time, the ship was *west* of Greenwich; the distance west in degrees and minutes is the

41. Let $x =$ the number of cents per basket, Delaware
And $y =$ the number of cents per basket, Whitestone
Then, $2x = 3y + 15$ (1)
And $3x = 6y - 45$ (2)
Multiplying (1) by 2, $4x = 6y + 30$ (3)
Subtracting (2) from (3), $x = 75$
Substituting 75 for x in (1), $150 = 3y + 15$
Transposing, $150 - 15 = 3y$; $\therefore y = 45$
Hence, Delaware peaches cost 75¢, and Whitestone, 45¢ per basket.

42. Let $x =$ the number of men
And $y =$ the number of women
Then, $x + y = 1000$ (1)
And $2.50x + 1.50y = 2340$ (2)
Multiplying (1) by 1.50, $1.50x + 1.50y = 1500$ (3)
Subtracting (3) from (2), $x = 840$
Substituting 840 for x in (1), $840 + y = 1000$; $\therefore y = 160$
Hence, there were 840 men and 160 women.

43. Let $x =$ the number for adults
And $y =$ the number for children
Then, $x + y = 300$ (1)
And $\frac{1}{2}x + \frac{1}{4}y = 100$ (2)
Multiplying (2) by 4, $2x + y = 400$ (3)
Subtracting (1) from (3), $x = 100$, for adults
Substituting 100 for x in (1), $100 + y = 300$; $\therefore y = 200$, for children

44. Let $x =$ the number of inches in length
And $y =$ the number of inches in width
Then, $x - y = 6$ (1)
And $2x + 2y = 60$ (2)
Multiplying (1) by 2, $2x - 2y = 12$ (3)
Adding (2) and (3), $4x = 72$; $\therefore x = 18$, the length in inches
Substituting 18 for x in (2), $36 + 2y = 60$; $\therefore y = 12$, the width in inches

45. Let $x =$ the number of months sea duty
And $y =$ the number of months shore duty
Then, $x + y = 12$ (1)
And $150x + 127\frac{1}{2}y = 1620$ (2)
Multiplying (2) by 2, $300x + 255y = 3240$ (3)
Multiplying (1) by 300, $300x + 300y = 3600$ (4)
Subtracting (3) from (4), $45y = 360$; $\therefore y = 8$
Substituting 8 for y in (1), $x + 8 = 12$; $\therefore x = 4$
Hence, he was 4 mo. on sea duty and 8 mo. on shore duty.

46. Let $x =$ the weight of a shaft in tons
And $y =$ the weight of a capital in tons
Then, $x + y = 94$ (1)
And $x - y = 74$ (2)
Adding (1) and (2), $2x = 168$; $\therefore x = 84$
Substituting 84 for x in (1), $84 + y = 94$; $\therefore y = 10$
Hence, a shaft weighed 84 T., a capital 10 T.

47. Let $x =$ the number of tickets to the grounds
And $y =$ the number of tickets to the grandstand
Then, $\frac{1}{2}x + \frac{1}{4}y = 700$ (1)
And $\frac{1}{2}x + 2\left(\frac{1}{4}y\right) = 800$
Or, $\frac{1}{2}x + \frac{1}{2}y = 800$ (2)
Subtracting (1) from (2), $\frac{1}{4}y = 100$; $\therefore y = 400$
Substituting 400 for y in (2), $\frac{1}{2}x + 200 = 800$; $\therefore x = 1200$
Hence, there were 1200 tickets to grounds and 400 to grandstand.

Page 138

24. April has 30 days = 30 × 24 hr., or 720 hr.; hence, the number of times I must wind my watch = 720 ÷ 36, or 20 times.

25. 5 oscillations per second = 60 × 5, or 300, per minute = 60 × 300, or 18,000, per hour.

26. From the Ans. to Ex. 25, the balance wheel loses 18,000 – 17,985, or 15, oscillations per hour = 24 × 15, or 360, per day = 7 × 360, or 2520, per week; since [Ex. 25] 5 oscillations should be made per second, the loss of 2520 oscillations means the loss of 2520 ÷ 5, or 504, sec. = 8 min. 24 sec.

27. 100 pr. = 100 ÷ 12, or $8\frac{1}{3}$, doz. pr.; $8\frac{1}{3}$ × 66¢ = $5.50, her earnings.

28. A bushel yields 56 × 4 oz., or 224 oz. = 224 ÷ 16, or 14 lb.

29. 5 da. 15 hr. = 120 hr. + 15 hr., or 135 hr.; the number of dozen jars made per hour = 11,250 ÷ 135, or $83\frac{1}{3}$ doz.; then, the output per day = 24 × $83\frac{1}{3}$ doz., or 2000 doz. jars = 24,000 jars.

30. 312,500 great gross = 12 × 312,500, or 3,750,000 gross;
3,750,000 × 20¢ = $750,000, the value.

31. $\frac{3}{4} + \frac{1}{10} = \frac{17}{20}$; hence, $\frac{3}{20}$ is charcoal; $\frac{3}{20}$ of 2000 lb. = 300 lb.; then, the number of bushels = 300 ÷ 15, or 20 bu.

32. 8028 gross = 12 × 8028, or 96,336 doz. = 12 × 96,336, or 1,156,032 single pens; 1,156,032 × $.789 = $912,109.248, or $912,109.25, the value.

33. 700 mi. = 700 × 5280 ft., or 3,696,000 ft.; 1 hr. = 60 × 60 sec., or 3600 sec.; then, 3,696,000 ft. ÷ 3600 = $1026\frac{2}{3}$ ft., the rate per second.

34. 1 hr. 15 min. 12 sec. = 60 min. + 15 min. + .2 min., or 75.2 min.;
13,912 stamps ÷ 75.2 = 185 stamps, the number canceled per minute.

35. 15 hr. 45 min. = 15.75 hr.; the rate per hour = 90 mi. ÷ 15.75 = 5.71+ mi., or 5.7 mi.

36. 1 mi. = 1760 yd.; $\frac{1}{2}$ of 1760 yd. = 880 yd., the rate per minute;
Then, the number of minutes = 1870 ÷ 880, or $2\frac{1}{8}$ min.

Page 139

37. 120 × 8 gal. = 960 gal., the amount of juice; the amount of concentrated juice = 960 × $\frac{3}{4}$ pt., or 720 pt. = 720 ÷ 2, or 360 qt. = 360 ÷ 4, or 90 gal.

Page 140

1. £420 = 420 × $4.8665 = $2043.93.

2. £24.75 = 24.75 × $4.8665 = $120.445875, or $120.45.

3. £56.125 = 56.125 × $4.8665 = $273.1323125, or $273.13.

4. 1800 fr. = 1800 × $.193 = $347.40.

5. 144.50 fr. = 144.50 × $.193 = $27.8885, or $27.89.

6. 850.75 M. = 850.75 × $.238 = $202.4785, or $202.48.

7. 36.25 lire = 36.25 × $.193 = $6.99625, or $7.00.

8. 49.80 pesetas = 49.80 × $.193 = $9.6114, or $9.61.

9. 2000 drachmas = 2000 × $.193 = $386.

10. £500 = 500 × $4.8665 = $2433.25;
1000 lire = 1000 × $.193 = $193.

Page 141

12.

	£	*s.*	*d.*
	8	3	4
12			4
20		3	.33+
	8	.1	67−

8.167 × $4.8665 = $39.74+.

13.

	£	*s.*	*d.*
	5	2	6
12			6
20		2	.5
	5	.1	25

5.125 × $4.8665 = $24.94+.

14.

	£	*s.*	*d.*
	7	6	9
12			9
20		6	.75
	7	.3	375

7.3375 × $4.8665 = $35.71−.

15.

	£	s.	d.
	12	7	7
12			7
20		7	.58+
	12	.3	79+

12.379 × $4.8665 = $60.24+.

16.

	£	s.	d.
	25	4	3
12			3
20		4	.25
	25	.2	125

25.2125 × $4.8665 = $122.70−.

17.

	£	s.	d.
	66	8	5
12			5
20		8	.42−
	66	.4	21−

66.421 × $4.8665 = $323.24−.

18.

	£	s.	d.
	100	8	1½
12			1½
20		8	.125
	100	.4	06

100.406 × $4.8665 = $488.63−.

19.

	£	s.	d.
	125	6	10
12			10
20		6	.83+
	125	.3	42−

125.342 × $4.8665 = $609.98−.

20.

	£	s.	d.
	440	18	9½
12			9½
20		18	.79+
	440	.9	40−

440.940 × $4.8665 = $2145.83+.

22. $1000 ÷ $4.8665 = 205.486+, the number of pounds; .486 × 20*s.* = 9.72*s.*, and .72 × 12*d.* = 8.64*d.*; hence, to the nearest penny, $1000 = £205 9*s.* 9*d.*

23. $3200 ÷ $4.8665 = 657.557−, the number of pounds; .557 × 20*s.* = 11.14*s.*, and .14 × 12*d.* = 1.68*d.*; hence, to the nearest penny, $3200 = £657 11*s.* 2*d.*

24. $5500 ÷ $4.8665 = 1130.176−, the number of pounds; .176 × 20*s.* = 3.52*s.*, and .52 × 12*d.* = 6.24*d.*; hence, to the nearest penny, $5500 = £1130 3*s.* 6*d.*

25. $48.25 ÷ $4.8665 = 9.915−, the number of pounds; .915 × 20*s.* = 18.3*s.*, and .3 × 12*d.* = 3.6*d.*; hence, to the nearest penny, $48.25 = £9 18*s.* 4*d.*

26. $62.75 ÷ $4.8665 = 12.894+, the number of pounds; .894 × 20*s.* = 17.88*s.*, and .88 × 12*d.* = 10.56*d.*; hence, to the nearest penny, $62.75 = £12 17*s.* 11*d.*

27. $90.10 ÷ $4.8665 = 18.514+, the number of pounds; .514 × 20*s.* = 10.28*s.*, and .28 × 12*d.* = 3.36*d.*; hence, to the nearest penny, $90.10 = £18 10*s.* 3*d.*

28. $77.14 ÷ $4.8665 = 15.851+, the number of pounds; .851 × 20*s.* = 17.02*s.*, and .02 × 12*d.* = .24*d.*; hence, to the nearest penny, $77.14 = £15 17*s.*

29. \$84.40 ÷ \$4.8665 = 17.343 +, the number of pounds; .343 × 20*s.* = 6.86*s.*, and .86 × 12*d.* = 10.32*d.*; hence, to the nearest penny, \$84.40 = £ 17 6*s.* 10*d.*

30. \$50.07 ÷ \$4.8665 = 10.289^-, the number of pounds; .289 × 20*s.* = 5.78*s.*, and .78 × 12*d.* = 9.36*d.*; hence, to the nearest penny, \$50.07 = £ 10 5*s.* 9*d.*

31. \$122.43 ÷ \$4.8665 = 25.158^-, the number of pounds; .158 × 20*s.* = 3.16*s.*, and .16 × 12*d.* = 1.92*d.*; hence, to the nearest penny, \$122.43 = £ 25 3*s.* 2*d.*

32. \$760.50 ÷ \$4.8665 = 156.272^+, the number of pounds; .272 × 20*s.* = 5.44*s.*, and .44 × 12*d.* = 5.28*d.*; hence, to the nearest penny, \$760.50 = £ 156 5*s.* 5*d.*

33. \$325.85 ÷ \$4.8665 = 66.958^-, the number of pounds; .958 × 20*s.* = 19.16*s.*, and .16 × 12*d.* = 1.92*d.*; hence, to the nearest penny, \$325.85 = £ 66 19*s.* 2*d.*

34. 2 × £ 38,000 = £ 76,000, the cost of both; 76,000 × \$4.8665 = \$369,854.

35. He works 6 × 9 hr., or 54 hr., per week; he earns 54 × 10*d.*, or 540*d.*; 540*d.* = $\frac{540}{12}$*s.*, or 45*s.* = £ $\frac{45}{20}$, or £ 2 5*s.*

Page 142

36. The Baldwins cost 15 × 3*d.*, or 45*d.*; the Newtowns cost 20 × 5*d.*, or 100*d.*; the whole cost = 45*d.* + 100*d.*, or 145*d.*; since 1 sovereign = 20 × 12*d.*, or 240*d.*, I received in change 240*d.* − 145*d.*, or 95*d.* = 7*s.* 11*d.*

37. Since £ 1 6*s.* = £ $1\frac{6}{20}$, or £ 1.3, the cost of 12 tons = 12 × £ 1.3 = £ 15.6, or £ 15 12*s.*

The cost per ton in our money = 1.3 × \$4.8665 = \$$6.326^+$, or \$6.33.

38. He sold 85 lb. + 84 lb. + 96 lb. = 265 lb.; he therefore received 265*d.*; 265*d.* = 22*s.* 1*d.* = £ 1 2*s.* 1*d.*

39. The fare for each = 194 × 2*d.* = 388*d.*; the fare for all = 3 × 388*d.* = 1164*d.*;

1164*d.* = 97*s.* = £ 4 17*s.*, the fare for all.

388*d.* = (388 ÷ 12)*s.*, or 32.33^+*s.* = £(32.33^+ ÷ 20), or £ 1.617^-;

£ 1.617 = 1.617 × \$4.8665 = \$$7.87^-$, the fare for each.

40. He worked 6 × 10 hr., or 60 hr., per week, and received 60 × 20 pf., or 1200 pf.;

1200 pf. = 12 M. = 12 × \$.238, or \$$2.86^-$, his earnings.

41. He buys 52 × 8 cups, or 416 cups, and expends 416 × 2 pf., or 832 pf. = 8 M. 32 pf.

42. 8 fr. 50 c. = $8\frac{1}{2}$ fr.; 3964 × $8\frac{1}{2}$ fr. = 33,694 fr., the toll paid.

43. The receipts in U.S. money = 103,120,268 × $.193 = $19,902,211.72+.

44. The fine in U.S. money = 5000 × $.238 = $1190.

45. £500 = 500 × $4.8665 = $2433.25;
Hence, the difference in cost = $2433.25 − $214.13 = $2219.12.

46. The cost = 2212 × £7779 = £17,207,148.
The cost in U.S. money = 17,207,148 × $4.8665 = $83,738,585.74+.

Page 146

12. The area = (42 × 60) sq. ft. = 2520 sq. ft.;
The value = 2520 × £75 = £189,000.

13. The cubic contents of the room = (16 × $13\frac{1}{2}$ × 10) cu. ft. = 2160 cu. ft.;
The quantity of oxygen = $\frac{1}{5}$ of 2160 cu. ft. = 432 cu. ft.

14. The area covered by each brick = ($8\frac{1}{4}$ × 2) sq. in. = $16\frac{1}{2}$ sq. in.;
The area of the street = (2310 × 30) sq. ft. = 69,300 sq. ft.;
69,300 sq. ft. = 69,300 × 144 sq. in. = 9,979,200 sq. in.; then,
9,979,200 sq. in. ÷ $16\frac{1}{2}$ sq. in. = 604,800, the number of bricks.

15. 6 mi. 1980 ft. = 6 × 5280 ft. plus 1980 ft. = 33,660 sq. ft.;
The area of the road = (15 × 33,660) sq. ft. = 504,900 sq. ft.;
504,900 sq. ft. = (504,900 ÷ 9) sq. yd = 56,100 sq. yd.;
Hence, the cost = 56,100 × $.55 = $30,855.

16. 9 ft. = 3 yd.; the contents = (3 × 3 × 440) cu. yd. = 3960 cu. yd.;
Then, the number of pounds of powder = 3960 cu. yd. ÷ 3 cu. yd., or 1320 lb.

17. The cubic contents of the box = (4 × $2\frac{1}{2}$ × 3) cu. ft. = 30 cu. ft.;
Then, the weight = 30 × $103\frac{1}{8}$ lb. = $3093\frac{3}{4}$ lb.

18. The area of the floor = (62 × 36) sq. ft. = 2232 sq. ft.;
Then, the maximum load = 2232 × 250 lb. = 558,000 lb.

19. The number of erasers, end to end, in a row the long way of the block = 18 in. ÷ 2 in., or 9 erasers; the number of rows in one layer = 15 in. ÷ $1\frac{1}{4}$ in., or 12 rows; then, in one layer there are 12 × 9 erasers, or 108 erasers; the number of layers in the block = 9 in. ÷ $\frac{1}{2}$ in., or 18 layers; hence, 18 × 108 erasers, or 1944 erasers, can be cut from the block.

20. 2 × $\frac{7}{8}$ in. = $1\frac{3}{4}$ in., the width of the two side margins;
$11\frac{1}{4}$ in. − $1\frac{3}{4}$ in. = $9\frac{1}{2}$ in., the width of the illustration;
$1\frac{1}{4}$ in. + $3\frac{1}{4}$ in. = $4\frac{1}{2}$ in., the width of the top and bottom margins;
$16\frac{1}{4}$ in. − $4\frac{1}{2}$ in. = $11\frac{3}{4}$ in., the length of the illustration;
Then, the area of the illustration = ($9\frac{1}{2}$ × $11\frac{3}{4}$) sq. in. = $111\frac{5}{8}$ sq. in.

21. The inside dimensions are, respectively: 22 in. − $1\frac{1}{2}$ in., or $20\frac{1}{2}$ in.; 19 in. − $1\frac{1}{2}$ in., or $17\frac{1}{2}$ in.; and 11 in. − $1\frac{1}{2}$ in., or $9\frac{1}{2}$ in. Hence, the cubic contents of the chest = ($20\frac{1}{2} \times 17\frac{1}{2} \times 9\frac{1}{2}$) cu. in. = $3408\frac{1}{8}$ cu. in.

22. The area in acres = (216 × 160) sq. rd. ÷ 160 sq. rd., or 216 A.;
The number of days = 216 A. ÷ 24 A., or 9 days.

23. Let x = the number of feet the reaper must go
Since 1 A. = 43,560 sq. ft., $18x = 43{,}560$
Dividing by 18, $x = 2420$, the distance in feet.

Page 148

25.

ft.	in.
602	11
576	9
26	2, difference

26.

gal.	qt.	pt.
63	0	0
	2	1
62	1	1, remaining

27.

lb.	oz.
86	9
	95
8223	7, consumed

28.

	bu.	pk.
12)	94	2
	7	$3\frac{1}{2}$, the quantity per day

29.

gross	doz.
24	4
	9
219	, the quantity in 9 hr.

Page 149

30. Adding the several amounts given in the first half of the table, we get 3301 hr. 43 min., the time required by hand.

Adding the several amounts given in the second half of the table, we get 1375 hr. 56.3 min., the time required by machinery.

31.

hr.	min.
11	40
1	48
9	52, shrinking cloth

hr.	min.
33	20
4	32.5
28	47.5, cutting cloth

hr.	min.
1000	0
66	40
933	20, sewing seams

hr.	min.
3	20
	17.5
3	2.5, cutting buttonholes

$$\begin{array}{rl} \text{hr.} & \text{min.} \\ 275 & 0 \\ 6 & 17.8 \\ \hline 268 & 42.2, \text{ working buttonholes} \end{array} \qquad \begin{array}{rl} \text{hr.} & \text{min.} \\ 1978 & 23 \\ 1296 & 20.5 \\ \hline 682 & 2.5, \text{ all others} \end{array}$$

Adding these six results, we get 1925 hr. 46.7 min., the total difference.

32. 15 hr. 32 min. + 19 hr. 58 min. + 17 hr. 15 min. + 18 hr. 12 min. = 70 hr. 57 min.

$$\begin{array}{rrl} & \text{hr.} & \text{min.} \\ 4) & 70 & 57 \\ \hline & 17 & 44\frac{1}{4}, \text{ the average time} \end{array}$$

33.

$$\begin{array}{rr} \text{lb.} & \text{oz.} \\ 21 & 14 \\ & 124 \\ \hline 2712 & 8, \text{ the total} \end{array}$$

34.

$$\begin{array}{rrl} & \text{lb.} & \text{oz.} \\ 25) & 21 & 14 \\ \hline & & 14, \text{ each packet} \end{array}$$

14 oz. ÷ 6 = $2\frac{1}{3}$ oz., each candle

35.

$$\begin{array}{rl} \text{A.} & \text{sq. rd.} \\ 84 & 82.5 \\ 16 & 147.5 \\ \hline 101 & 70\ , \text{ the total} \end{array} \qquad \begin{array}{rrl} & \text{A.} & \text{sq. rd.} \\ 3) & 101 & 70 \\ \hline & 33 & 130, \text{ sold} \end{array} \qquad \begin{array}{rl} \text{A.} & \text{sq. rd.} \\ 101 & 70 \\ 33 & 130 \\ \hline 67 & 100, \text{ remaining} \end{array}$$

36.

$$\begin{array}{rr} \text{rd.} & \text{ft.} \\ 3 & 10\frac{1}{2} \\ & 28 \\ \hline 101 & 13\frac{1}{2} \end{array} \quad \begin{array}{rr} \text{rd.} & \text{ft.} \\ 4 & 14 \\ & 2 \\ \hline 9 & 11\frac{1}{2} \end{array} \quad \begin{array}{rr} \text{rd.} & \text{ft.} \\ 7 & 4\frac{1}{2} \\ & 21 \\ \hline 152 & 12 \end{array} \quad \begin{array}{rr} \text{rd.} & \text{ft.} \\ 8 & 4 \\ & 12 \\ \hline 98 & 15 \end{array} \quad \begin{array}{rr} \text{rd.} & \text{ft.} \\ 13 & 15\frac{1}{2} \\ & 13 \\ \hline 181 & 3\frac{1}{2} \end{array} \quad \begin{array}{rr} \text{rd.} & \text{ft.} \\ & 10\frac{1}{2} \\ & 6 \\ \hline 3 & 13\frac{1}{2} \end{array}$$

Then, 101 rd. $13\frac{1}{2}$ ft. + 9 rd. $11\frac{1}{2}$ ft. + 152 rd. 12 ft. + 98 rd. 15 ft. + 181 rd. $3\frac{1}{2}$ ft. + 9 rd. $1\frac{1}{2}$ ft. + 9 rd. $6\frac{1}{2}$ ft. + 3 rd. $13\frac{1}{2}$ ft. = 1 mi. 246 rd. 11 ft., the length.

Page 152

2.

$$\begin{array}{rrrrl} & 77^\circ & 03' & 06'' & \text{W., the longitude of Washington} \\ & 71^\circ & 03' & 50'' & \text{W., the longitude of Boston} \\ \hline 15) & 5^\circ & 59' & 16''. & \text{the difference in longitude} \\ \hline & & 23' & 57^{+}{}'' ; & \therefore \text{23 min. 57 sec. is the difference in time.} \end{array}$$

Since Boston is *east* of Washington, the time is *later* in Boston ; that is, when it is noon at Washington it is 23 min. 57 sec. after noon at Boston.

3.

$$\begin{array}{rrrrl} & 77^\circ & 03' & 06'' & \text{W., the longitude of Washington} \\ & 74^\circ & 00' & 24'' & \text{W., the longitude of New York} \\ \hline 15) & 3^\circ & 2' & 42'', & \text{the difference in longitude} \\ \hline & & 12' & 11^{-}{}'' ; & \therefore \text{12 min. 11 sec. is the difference in time.} \end{array}$$

Since New York is *east* of Washington, the time is *later* in New York ; that is, when it is noon at Washington it is 12 min. 11 sec. after noon at New York.

4. $87^\circ\ 36'\ 45''$ W., the longitude of Chicago
$77^\circ\ 03'\ 06''$ W., the longitude of Washington
$15\overline{)10^\circ\ 33'\ 39''}$, the difference in longitude
$42'\ 15^{-''}$; ∴ 42 min. 15 sec. is the difference in time.

Since Chicago is *west* of Washington, the time is *earlier* in Chicago; that is, when it is noon at Washington it is 42 min. 15 sec. before noon at Chicago, or 17 min. 45 sec. after 11 A.M.

5. $77^\circ\ 03'\ 06''$ W., the longitude of Washington
$13^\circ\ 23'\ 44''$ E., the longitude of Berlin
$15\overline{)90^\circ\ 26'\ 50''}$, the difference in longitude
$6^\circ\ 1'\ 47^{+''}$; ∴ 6 hr. 1 min. 47 sec. is the difference in time.

Since Berlin is *east* of Washington, the time is *later* in Berlin; that is, when it is noon at Washington it is 6 hr. 1 min. 47 sec. after noon at Berlin, or 1 min. 47 sec. after 6 P.M.

6. $77^\circ\ 03'\ 06''$ W., the longitude of Washington
$2^\circ\ 20'\ 14''$ E., the longitude of Paris
$15\overline{)79^\circ\ 23'\ 20''}$, the difference in longitude
$5^\circ\ 17'\ 33^{+''}$; ∴ 5 hr. 17 min. 33 sec. is the difference in time.

Since Paris is *east* of Washington, the time is *later* in Paris; that is, when it is noon at Washington it is 5 hr. 17 min. 33 sec. after noon at Paris, or 17 min. 33 sec. after 5 P.M.

7. $15\overline{)77^\circ\ 03'\ 06''}$, the difference in longitude
$5^\circ\ 8'\ 12^{+''}$; ∴ 5 hr. 8 min. 12 sec. is the difference in time.

Since London is *east* of Washington, the time is *later* in London; that is, when it is noon at Washington it is 5 hr. 8 min. 12 sec. after noon at London, or 8 min. 12 sec. after 5 P.M.

8. $77^\circ\ 03'\ 06''$ W., the longitude of Washington
$9^\circ\ 58'\ 25''$ E., the longitude of Hamburg
$15\overline{)87^\circ\ 1'\ 31''}$, the difference in longitude
$5^\circ\ 48'\ 6^{+''}$; ∴ 5 hr. 48 min. 6 sec. is the difference in time.

Since Hamburg is *east* of Washington, the time is *later* in Hamburg; that is, when it is noon at Washington it is 5 hr. 48 min. 6 sec. after noon at Hamburg, or 48 min. 6 sec. after 5 P.M.

9. $77^\circ\ 03'\ 06''$ W., the longitude of Washington
$4^\circ\ 53'\ 04''$ E., the longitude of Amsterdam
$15\overline{)81^\circ\ 56'\ 10''}$, the difference in longitude
$5^\circ\ 27'\ 45^{-''}$; ∴ 5 hr. 27 min. 45 sec. is the difference in time.

Since Amsterdam is *east* of Washington, the time is *later* in Amsterdam; that is, when it is noon at Washington it is 5 hr. 27 min. 45 sec. after noon at Amsterdam, or 27 min. 45 sec. after 5 P.M.

10.

$$\begin{array}{rrrl} & 77^\circ & 03' & 06'' \text{ W., the longitude of Washington} \\ & 18^\circ & 28' & 40'' \text{ E., the longitude of Cape Town} \\ \hline 15) & 95^\circ & 31' & 46'', \text{ the difference in longitude} \\ \hline & 6^\circ & 22' & 7+''; \therefore 6 \text{ hr. } 22 \text{ min. } 7 \text{ sec. is the difference in time.} \end{array}$$

Since Cape Town is *east* of Washington, the time is *later* in Cape Town; that is, when it is noon at Washington it is 6 hr. 22 min. 7 sec. after noon at Cape Town, or 22 min. 7 sec. after 6 P.M.

Page 153

12. hr. min.

$$\begin{array}{rl} 2 & 21, \text{ diff. in time} \\ & 15 \\ \hline 35 & 15 \end{array} \qquad \begin{array}{rrrl} 77^\circ & 03' & 06' & \text{W. (Wash.)} \\ 35^\circ & 15' & & \\ \hline 41^\circ & 48' & 06'' & \text{W.} \end{array}$$

35° 15′, diff. in longitude

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 41° 48′ 6″ W.

13. hr. min.

$$\begin{array}{rl} 4 & 36, \text{ diff. in time} \\ & 15 \\ \hline 69 & 00 \end{array} \qquad \begin{array}{rrrl} 77^\circ & 03' & 06'' & \text{W. (Wash.)} \\ 69^\circ & & & \\ \hline 8^\circ & 03' & 06'' & \text{W.} \end{array}$$

69° 00′, diff. in longitude

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 8° 3′ 6″ W.

14. hr. min.

$$\begin{array}{rl} 3 & 42, \text{ diff. in time} \\ & 15 \\ \hline 55 & 30 \end{array} \qquad \begin{array}{rrrl} 77^\circ & 03' & 06'' & \text{W. (Wash.)} \\ 55^\circ & 30' & & \\ \hline 21^\circ & 33' & 06'' & \text{W.} \end{array}$$

55° 30′, diff. in longitude

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 21° 33′ 6″ W.

15. hr. min.

$$\begin{array}{rl} 1 & 42, \text{ diff. in time} \\ & 15 \\ \hline 25 & 30 \end{array} \qquad \begin{array}{rrrl} 77^\circ & 03' & 06'' & \text{W. (Wash.)} \\ 25^\circ & 30' & & \\ \hline 102^\circ & 33' & 06'' & \text{W.} \end{array}$$

25° 30′, diff. in longitude

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 102° 33′ 6″ W.

16. hr. min.	
2 6, diff. in time	77° 03′ 06″ W. (Wash.)
15	31° 30′
31 30	108° 33′ 06″ W.
31° 30′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 108° 33′ 6″ W.

17. hr. min.	
5 51, diff. in time	77° 03′ 06″ W. (Wash.)
15	87° 45′
87 45	164° 48′ 06″ W.
87° 45′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 164° 48′ 6″ W.

18. hr. min.	
4 27½, diff. in time	77° 03′ 06″ W. (Wash.)
15	66° 52′ 30″
66 52½	143° 55′ 36″ W.
66° 52½′, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 143° 55′ 36″ W.

19. hr. min.	
1 5¾, diff. in time	77° 03′ 06″ W. (Wash.)
15	16° 26′ 15″
16 26¼	60° 36′ 51″ W.
16° 26¼′, diff. in longitude	

Since the time of this place is *later* than that of Washington, this place is *east* of Washington; hence, it is in longitude 60° 36′ 51″ W.

20. hr. min. sec.	
4 00 15, diff. in time	77° 03′ 06″ W. (Wash.)
15	60° 03′ 45″
60 03 45	137° 06′ 51″ W.
60° 03′ 45″, diff. in longitude	

Since the time of this place is *earlier* than that of Washington, this place is *west* of Washington; hence, it is in longitude 137° 6′ 51″ W.

21. 72° 4′ 0″ W., the longitude of Norwich, Conn.
1° 18′ 0″ W., the longitude of Norwich, Eng.
15)70° 46′ 0″, the difference in longitude
4° 43′ 4″; ∴ 4 hr. 43 min. 4 sec. is the difference in time, and the sun crosses the meridian of Norwich, Conn., 4 hr. 43 min. 4 sec. later.

22. 87° 36′ 45″ W. (Chic.)
71° 03′ 50″ W. (Bost.)
15)16° 32′ 55″, diff.
1° 6′ 12−″
1 hr. 6 min. 12 sec., diff. in time.

104° 58′ 00″ W. (Den.)
71° 03′ 50″ W. (Bost.)
15)33° 54′ 10″, diff.
2° 15′ 37−″
2 hr. 15 min. 37 sec., diff. in time.

122° 24′ 32″ W. (San F.)
71° 03′ 50″ W. (Bost.)
15)51° 20′ 42″, diff.
3° 25′ 23−″
3 hr. 25 min. 23 sec., diff. in time.

Since Chicago, Denver, and San Francisco are *west* of Boston, the time of each is *earlier* than that of Boston; that is, when it is 1:13 A.M. at Boston, it is 6 min. 48 sec. after midnight at Chicago, 57 min. 23 sec. after 10 P.M., day before, at Denver, and 47 min. 37 sec. after 9 P.M., day before, at San Francisco.

23. 71° 03′ 50″ W. (Bost.)
2° 20′ 14″ E. (Paris)
15)73° 24′ 4″, diff.
4° 53′ 36+″
4 hr. 53 min. 36 sec., diff. in time.

94° 47′ 26″ W. (Gal.)
71° 03′ 50″ W. (Bost.)
15)23° 43′ 36″, diff.
1° 34′ 54+″
1 hr. 34 min. 54 sec., diff. in time.

Hence, Parisians had been living 4 hr. 53 min. 36 sec. in the twentieth century; for the people of Galveston, 1 hr. 34 min. 54 sec. still remained.

Page 154

24. 1 hr. 5 min.
15
16 hr. 15 min.
16° 15′, diff. in longitude.

Since the time of the ship is *earlier* than that of Greenwich, the ship is *west* of Greenwich; hence, it is in longitude 16° 15′ W.

25. Since on Saturday noon the ship's time was *later* than Greenwich time, the ship was *east* of Greenwich; the distance east in degrees and minutes is the same as the number of hours and minutes in 15 × 35 min. = 8 hr. 45 min. The ship was therefore in longitude 8° 45′ E.

Since on Tuesday noon the ship's time was *earlier* than Greenwich time, the ship was *west* of Greenwich; the distance west in degrees and minutes is the

same as the number of hours and minutes in 15 × 13 min. = 3 hr. 15 min. The ship was therefore in longitude 3° 15′ W.

Since the ship sailed from 8° 45′ E. to 3° 15′ W., she sailed 12° west.

27.

$$\begin{array}{rrrl} 74^\circ & 00' & 24'' & \text{W. (N.Y.)}\\ \underline{120^\circ} & \underline{58'} & \underline{06''} & \text{E. (Man.)}\\ 15)\underline{194^\circ} & \underline{58'} & \underline{30''}, & \text{diff.}\\ 12^\circ & 59' & 54'' & \end{array}$$

12 hr. 59 min. 54 sec., diff. in time.

Since Manila is *east* from New York, the time of Manila is *later* than that of New York; that is, when it is noon in New York, May 1, it is 59 min. 54 sec. after midnight, May 2, in Manila.

28.

$$\begin{array}{rrrl} 74^\circ & 00' & 24'' & \text{W. (N.Y.)}\\ \underline{106^\circ} & \underline{48'} & \underline{37''} & \text{E. (Bat.)}\\ 15)\underline{180^\circ} & \underline{49'} & \underline{1''}, & \text{diff.}\\ 12^\circ & 3 & 16+'' & \end{array}$$

12 hr. 3 min. 16 sec., diff. in time.

Since Batavia is *east* from New York, the time of Batavia is *later* than that of New York; that is, when it is noon in New York, May 1, it is 3 min. 16 sec. after midnight, May 2, in Batavia.

29.

$$\begin{array}{rrrl} 74^\circ & 00' & 24'' & \text{W. (N.Y.)}\\ \underline{113^\circ} & \underline{16'} & \underline{30''} & \text{E. (Can.)}\\ 15)\underline{187^\circ} & \underline{16'} & \underline{54''}, & \text{diff.}\\ 12^\circ & 29' & 8-'' & \end{array}$$

12 hr. 29 min. 8 sec., diff. in time.

Since Canton is *east* from New York, the time of Canton is *later* than that of New York; that is, when it is noon in New York, May 1, it is 29 min. 8 sec. after midnight, May 2, in Canton.

30.

$$\begin{array}{rrrl} 74^\circ & 00' & 24'' & \text{W. (N.Y.)}\\ \underline{144^\circ} & \underline{58'} & \underline{35''} & \text{E. (Mel.)}\\ 15)\underline{218^\circ} & \underline{58'} & \underline{59''}, & \text{diff.}\\ 14^\circ & 35' & 56-'' & \end{array}$$

14 hr. 35 min. 56 sec., diff. in time.

Since Melbourne is *east* from New York, the time of Melbourne is *later* than that of New York; that is, when it is noon in New York, May 1, it is 35 min. 56 sec. after 2 A.M., May 2, in Melbourne.

31.

$$\begin{array}{rrrl} 74^\circ & 00' & 24'' & \text{W. (N.Y.)}\\ \underline{72^\circ} & \underline{48'} & \underline{56''} & \text{E. (Bom.)}\\ 15)\underline{146^\circ} & \underline{49'} & \underline{20''}, & \text{diff.}\\ 9^\circ & 47' & 17+'' & \end{array}$$

9 hr. 47 min. 17 sec., diff. in time.

Since Bombay is *east* from New York, the time of Bombay is *later* than that of New York; that is, when it is noon in New York, May 1, it is 47 min. 17 sec. after 9 P.M., May 1, in Bombay.

32.

$$\begin{array}{rrrl} 74^\circ & 00' & 24'' & \text{W. (N.Y.)}\\ \underline{18^\circ} & \underline{28'} & \underline{40''} & \text{E. (C.T.)}\\ 15)\underline{92^\circ} & \underline{29'} & \underline{4''}, & \text{diff.}\\ 6^\circ & 9' & 56+'' & \end{array}$$

6 hr. 9 min. 56 sec., diff. in time.

Since Cape Town is *east* from New York, the time of Cape Town is *later* than that of New York; that is, when it is noon in New York, May 1, it is 9 min. 56 sec. after 6 P.M., May 1, in Cape Town.

33. 114° 10′ 02″ E. (H.-K.) 360° 0′ 0″
157° 51′ 34″ W. (Hon.) 272° 1′ 36″
272° 1′ 36″ 15) 87° 58′ 24″, diff. in longitude
5° 51′ 54−″; 5 hr. 51 min. 54 sec., diff. in time.

Since Hong-Kong is 87° 58′ 24″ *west* of Honolulu, its time is 5 hr. 51 min. 54 sec. *earlier* than that of Honolulu; that is, when it is noon at Honolulu, it is 5 hr. 51 min. 54 sec. before noon at Hong-Kong. From noon, March 10 (Hong-Kong time), to noon, March 25 (Honolulu time), is 15 days less 5 hr. 51 min. 54 sec., or 14 da. 18 hr. 8 min. 6 sec. But this is 1 day short of the actual time, inasmuch as the calendar is set back a day in sailing eastward over the 180th meridian. Therefore, the actual time of the voyage was 15 da. 18 hr. 8 min. 6 sec.

Page 156

1. Since New York (75° W.) is *east* of Chicago (90° W.), its time is 1 hr. *later* than that of Chicago; hence, when it is 10:30 A.M. in Chicago, it is 11:30 A.M. in New York.

Since New Orleans (90° W.) and San Antonio (90° W.) have the same time as Chicago (90° W.), they received the message at 10:30 A.M.

Since Portland, Ore. (120° W.), is *west* of Chicago (90° W.), its time is 2 hr. *earlier* than that of Chicago; hence, when it is 10:30 A.M. in Chicago, it is 8:30 A.M. in Portland.

2. Since Salt Lake City (105° W.) is *west* of St. Louis (90° W.), its time is 1 hr. *earlier* than that of St. Louis; hence, when it is 12:15 P.M. in St. Louis, it is 11:15 A.M. in Salt Lake City.

Since Portland, Me. (75° W.), is *east* of St. Louis (90° W.), its time is 1 hr. *later* than that of St. Louis; hence, when it is 12:15 P.M. in St. Louis, it is 1:15 P.M. in Portland.

Since Manila (120° E.) is *east* of St. Louis (90° W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 120°, or 210°, which makes a time difference of (210 ÷ 15), or 14, hr. Hence, when it is 12:15 P.M. in St. Louis, it is 2:15 A.M. (next day) in Manila.

Since Bombay (75° E.) is *east* of St. Louis (90° W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 75°, or 165°, which makes a time difference of (165 ÷ 15), or 11, hr. Hence, when it is 12:15 P.M. in St. Louis, it is 11:15 P.M. in Bombay.

Since Berlin (15° E.) is *east* of St. Louis (90 W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 15°, or 105°, which makes a time difference of (105 ÷ 15), or 7, hr. Hence, when it is 12:15 P.M. in St. Louis, it is 7:15 P.M. in Berlin.

Since London (0°) is *east* of St. Louis (90° W.), its time is 6 hr. *later* than that of St. Louis; that is, when it is 12 : 15 P.M. in St. Louis, it is 6 : 15 P.M. in London.

Since Tokyo (135° E.) is *east* of St. Louis (90° W.), its time is *later* than that of St. Louis. The difference between their meridians is 90° + 135°, or 225°, which makes a time difference of (225 ÷ 15), or 15, hr. Hence, when it is 12 : 15 P.M. in St. Louis, it is 3.15 A.M. (next day) in Tokyo.

3. Since Madrid (0°) is *east* of Havana (75° W.), its time is 5 hr. *later* than that of Havana; hence, when it is 2 A.M. in Havana, it is 7 A.M. in Madrid.

4. Since Washington (75° W.) is *west* of Manila (120° E.), its time is *earlier* than that of Manila. The difference between their meridians is 75° + 120°, or 195°, which makes a time difference of (195 ÷ 15), or 13, hr. Hence, the time from 5 : 41 A.M. to 7 : 40 A.M., May 1, in Manila, is the same as the time from 4 : 41 P.M. to 6 : 40 P.M., Apr. 30, in Washington.

5. Since Manila (120° E.) is *east* of Madrid (0°), its time is 8 hr. *later* than that of Madrid; that is, when it is 6 : 20 P.M. in Madrid, it is 2 : 20 A.M. (next day) in Manila. As the *Olympia* opened fire at 5 : 41 A.M. [Ex. 4], the news therefore reached Madrid 20 hr. 39 min. later.

Page 157

6. Since Manila (120° E.) is *east* of London (0°), its time is 8 hr. *later* than that of London; hence, when it is 10 A.M. in London, it is 6 P.M. in Manila.

7. Since Cairo (30° E.) is *east* of London (0°), its time is 2 hr. *later* than that of London; hence, when it is 3 : 15 P.M. in London, it is 5 : 15 P.M. in Cairo.

8. Since New York (75° W.) is *west* of London (0°), its time is 5 hr. *earlier* than that of London; hence, when it is 1¼ hr. later than 3 : 15 P.M., or 4 : 30 P.M., in London [Ex. 7], it is 11 : 30 A.M. in New York.

9. Since Washington (75° W.) is *east* of San Francisco (120° W.), its time is 3 hr. *later* than that of San Francisco; that is, when it is 5 : 12 A.M. in San Francisco, it is 8 : 12 A.M. in Washington. Hence, it took the shock 7 min. 20 sec. to reach Washington.

10. Since Tokyo (135° E.) is *east* of Port Arthur (120° E.), its time is 1 hr. *later* than that of Port Arthur; hence, when it is 10 P.M., Jan. 2, in Port Arthur, it is 11 P.M., Jan. 2, in Tokyo.

Since St. Petersburg (30° E.) and London (0°) are *west* of Port Arthur (120° E.), their times are respectively 6 hr. and 8 hr. *earlier* than that of Port Arthur; hence, when it is 10 P.M., Jan. 2, in Port Arthur, it is 4 P.M., Jan. 2, in St. Petersburg, and 2 P.M., Jan. 2, in London.

Since New York (75° W.) is *west* of Port Arthur (120° E.), its time is *earlier* than that of Port Arthur. The difference between their meridians is 75° + 120°, or 195°, which makes a time difference of (195 ÷ 15), or 13, hr. Hence, when it is 10 P.M., Jan. 2, in Port Arthur, it is 9 A.M., Jan. 2, in New York.

11. The time from 12:15 P.M., May 17, to 9:18 P.M., May 29, is 12 da. 9 hr. 3 min.; but since the Lizard (0°) is *east* of Sandy Hook (75° W.), its time is 5 hr. *later* than that of Sandy Hook. Hence, the true time of the *Atlantic* was 12 da. 9 hr. 3 min. less 5 hr., or 12 da. 4 hr. 3 min.

12.

$$\begin{array}{r} 15\overline{)21^\circ\ \ 0'} \\ 1^\circ\ 24' \end{array}$$

1 hr. 24 min.,
diff. in time.

The vessel began pumping 5 hr. before 2:27 P.M., or 9:27 A.M., Greenwich time; since the vessel is *west* of Greenwich, her true time is 1 hr. 24 min. *earlier* than that of Greenwich; hence the pumps began working at 8:03 A.M.

13.

$$\begin{array}{rrrl} & 75^\circ & 0' & 0''\text{ W. (N.Y.)} \\ & 2^\circ & 20' & 14''\text{ E. (Paris)} \\ \hline 15) & 77^\circ & 20' & 14''\text{, diff.} \\ \hline & 5^\circ & 9' & 21^{-''} \end{array}$$

5 hr. 9 min. 21 sec.,
diff. in time.

Since New York, which takes its time from the 75th meridian, is *west* of Paris, its time is *earlier* than that of Paris; hence, when it is 3 P.M. in Paris, it is 50 min. 39 sec. after 9 A.M. in New York.

14. Since Chicago (90° W.), Denver (105° W.), and San Francisco (120° W.), are *west* of Washington (75° W.), their times are respectively 1 hr., 2 hr., and 3 hr. *earlier* than that of Washington; hence, when it was 12 P.M., Dec. 31, '04, in Washington, it was 11 P.M., Dec. 31, '04, in Chicago; 10 P.M., Dec. 31, '04, in Denver; and 9 P.M., Dec. 31, '04, in San Francisco.

Considering Manila (120° E.), Tokyo (135° E.), Melbourne (150° E.), Bombay (75° E.), Berlin (15° E.), and London (0°), as *east* of Washington (75° W.), their times are *later* than that of Washington. Following is the difference between the meridian of Washington and that of each of these cities, the consequent difference in time, and the date and time in each city when it was 12 P.M., Dec. 31, '04, in Washington: —

CITY	DIFF. IN LONGITUDE	DIFF. IN TIME	DATE AND TIME
Manila	75° + 120° = 195°	195 ÷ 15, or 13, hr.	Jan. 1, '05, 1 P.M.
Tokyo	75° + 135° = 210°	210 ÷ 15, or 14, hr.	Jan. 1, '05, 2 P.M.
Melbourne	75° + 150° = 225°	225 ÷ 15, or 15, hr.	Jan. 1, '05, 3 P.M.
Bombay	75° + 75° = 150°	150 ÷ 15, or 10, hr.	Jan. 1, '05, 10 A.M.
Berlin	75° + 15° = 90°	90 ÷ 15, or 6, hr.	Jan. 1, '05, 6 A.M.
London	75°	75 ÷ 15, or 5, hr.	Jan. 1, '05, 5 A.M.

Page 163

1. The volume of the book = (19 × 14½ × 2) cu. cm. = 551 cu. cm.

2. The capacity of the shed = (6 × 5 × 3.2) cu. m. = 96 cu. m., or 96 steres.

3. The quantity of water required = (1 × 1 × 1) cu. dm. = 1 cu. dm., or 1000 cu. cm.

4. Since 1 Km. = 1000 m., the solid contents of the wall = (1000 × 1 × 1.6) cu. m. = 1600 cu. m.

5. Since the volume, 1 cu. cm., is the product of the three dimensions expressed in centimeters, the value of the missing dimension may be found by dividing 1 by (40 × 15); hence, the third dimension is $\frac{1}{600}$ cm.; that is, the gold must be beaten until it is $\frac{1}{600}$ cm., or $\frac{1}{60}$ mm., in thickness.

6. The volume of the block = (4 × 1.25 × 1.25) cu. m. = 6.25 cu. m.;
The value of the marble = 6.25 × $28 = $175.

7. Since 1 cu. Hm. = 1000 cu. Dm., and 1 cu. Dm. = 1000 cu. m., 1 cu. Hm. = 1,000,000 cu. m.; therefore, 320 cu. Hm. = 320,000,000 cu. m., the amount of gas produced.

8. Since 3.05 m. = 305 cm., the volume of such a timber = (61 × 61 × 305) cu. cm. = 1,134,905 cu. cm.

Page 164

1. The capacity of the box = (60 × 50 × 40) cu. cm. = 120,000 cu. cm.;
Hence, the box will hold 120,000 cu. cm., or 120 l., of rice.

2. 200 l. = 2 Hl.; since 2 Hl. of corn cost $12, 24 Hl. cost $\frac{24}{2}$ × $12 = $144.

3. The cost = 400 × $.25, or $100; at 30¢ per $\frac{3}{4}$ liter, the oil sold for $\frac{4}{3}$ × 30¢, or 40¢, per liter, and 400 liters sold for 400 × $.40 = $160. Hence, the gain = $160 − $100 = $60.

4. The yield per hektare = $110\frac{1}{2}$ million Hl. ÷ $6\frac{1}{2}$ million = 17 Hl.

Page 165

5. The total yield of olives = 750 × 30 l. = 22,500 l., or 225 Hl.

6. Since 1000 l. = 1 cu. m., 350 l. = .35 cu. m.; then, 1 engine throws 60 × .35 cu. m., or 21 cu. m., per minute, and 60 × 21 cu. m., or 1260 cu. m., per hour; and 4 engines throw 4 × 1260 cu. m., or 5040 cu. m., of water per hour.

Page 167

1. 142 m. = 142 × 39.37 in., or 5590.54 in. = (5590.54 ÷ 12) ft., or $465.878\frac{1}{3}$ ft.; hence, the height of the spire = 465.878 ft.

2. 139.5 m. = 139.5 × 39.37 in., or 5492.115 in. = (5492.115 ÷ 12) ft., or $457.676\frac{1}{4}$ ft.; hence, the height of the pyramid = 457.676 ft.

3. 54.5 m. = 54.5 × 39.37 in., or 2145.665 in. = (2145.665 ÷ 12) ft., or 178.805+ ft.; hence, the height of the Leaning Tower = 178.805 ft.

4. 203 m. = 203 × 39.37 in., or 7992.11 in. = (7992.11 ÷ 12) ft., or 666.009+ ft.; hence, the height of "203-meter Hill" = 666.009 ft.

5. 14.9 Km. = 14.9 × .62137 mi., or 9.258413 mi.; hence, the length of the St. Gothard tunnel = 9.258 mi.

6. 78 Km. = 78 × .62137 mi., or 48.46686 mi.; hence, the length of the Panama Railroad = 48.467 mi.

7. 5318.9 Km. = 5318.9 × .62137 mi., or 3305.004893 mi.; hence, the length of the cable = 3305.005 mi.

8. 23 cm. = .23 m. = .23 × 39.37 in., or 9.0551 in.; hence, the length of the hairspring = 9.055 in.

9. 7 mm. = .007 m. = .007 × 39.37 in. = .27559 in.; hence, the bore of a Mauser rifle = .276 in.

10. On a street 12 m. wide the height of the walls may be 12 m. + 6 m., or 18 m. = 18 × 39.37 in., or 708.66 in. = (708.66 ÷ 12) ft., or 59.055 ft.

On a street 18 m. wide the height of the walls may be 20 m. = 20 × 39.37 in., or 787.4 in. = (787.4 ÷ 12) ft., or 65.617⁻ ft.

11. Since 39.37 in. = 1 m., 9 ft. 2 in., or 110 in., is equal to as many meters as 39.37 is contained times in 110; that is, 110 ÷ 39.37, or 2.794+; hence, the ceilings must be at least 2.794 m. high.

12. Since 1 a. = 1 sq. Dm., 100 a., or 1 Ha. = 1 sq. Hm., and 100 Ha. = 100 sq. Hm., or 1 sq. Km.; hence, 600,000 Ha. = 6000 sq. Km., the area in Portugal; 300,000 Ha. = 3000 sq. Km., the area in Spain; and 80,000 Ha. = 800 sq. Km., the area in Italy.

13. The shipment contained 1000 × $12\frac{1}{2}$ Kg. = 12,500 Kg. = 12.5 M.T.

14. The amount of rock removed = (1278 × 3.65 × 3) cu. m. = 13,994.1 cu. m.

Page 168

15. The total amount removed = 12 × 4500 cu. m. = 54,000 cu. m.;
The cost = 54,000 × 3 pf., or 162,000 pf. = 1620 M.

16. The total quantity of cotton = 5.5 × 3 M.T., or 16.5 M.T. = 165 Q.;
The value of the cotton = 165 × $9.25 = $1526.25.

17. At 5¢ per 15 g. the postage cost $\frac{135}{15}$ × 5¢ = 45¢.

18. $\frac{1}{5}$ of 800 g. = 160 g., husk; 800 g. − 160 g. = 640 g., marketable coffee.

19. 2541.35 Kg. = 2541.35 × 32.1507 oz., or 81,706.181445 oz.; hence, to the nearest thousandth, the output of gold = 81,706.181 oz.

21. 1 cu. cm. of water weighs 1 g.; 1 cu. cm. of olive oil weighs 36.6 g. ÷ 40, or .915 g.; therefore, the specific gravity of olive oil is .915.

22. 1 l. of water weighs 1 Kg.; 1 l. of mercury weighs 2 × 6.799 Kg., or 13.598 Kg.; therefore, the specific gravity of mercury is 13.598.

23. 1 cu. cm. of water weighs 1 g.; since (10 × 8 × 2) cu. cm., or 160 cu. cm., of cork weigh 384 dg., or 38.4 g., 1 cu. cm. of cork weighs 38.4 g. ÷ 160 = .24 g.; therefore, the specific gravity of cork is .24.

24. 25 l. of water weigh 25 Kg.; therefore, the weight of 25 l. of naphtha is .848 × 25 Kg. = 21.2 Kg.

25. The area of 1 m., or 100 cm., of the cloth was (140 × 100) sq. cm. = 14,000 sq. cm.; since (40 × 50) sq. mm., or 20 sq. cm., of cloth weighed 62 cg., 14,000 sq. cm. weighed $\frac{14000}{20}$ × 62 cg. = 43,400 cg., or 434 g.

26. The amount of fresh codfish = 31,000,000 Kg. = 31,000,000 × 2.2046 lb., or 68,342,600 lb.

The amount of dried codfish = 1,500,000 Kg. + $\frac{1}{2}$ of 31,000,000 Kg. = 17,000,000 Kg. = 17,000,000 × 2.2046 lb., or 37,478,200 lb.

Page 169

27. Each light consumes 4 × 7 × 15 l., or 420 l., of gas per week;
800 lights consume 800 × 420 l., or 336,000 l., of gas per week.

28. Since 336,000 l. of gas are used a wk. [Ex. 27, Ans.], the number of kilos of the substance required is 336,000 l. ÷ 300 l., or 1120 Kg.; and the number of 50-Kg. boxes = 1120 Kg. ÷ 50 Kg., or 22.4 boxes.

29. 1 qt. = .94636 l.; since $\frac{2}{23}$ of .94636 l. = $.08229^+$ l., the volume of 1 qt. of water after freezing is .94636 l. + $.08229^+$l., or 1.02865 l., which is $.02865^+$ l., or 28.65^+ cu. cm., more than a liter.

30. Since 100 kilos = 1 metric quintal, 17 Q. cost 17 × 15 fr. = 255 fr.

31. 16.2 m. = 16.2 × 39.37 in., or 637.794 in. = (637.794 ÷ 12) ft., or 53 ft. 2^- in.; hence, the French locomotive is 53 ft. 2 in. − 41 ft. 4 in., or 11 ft. 10 in., longer.

32. The total weight of the coffee = 500 × 60 Kg., or 30,000 Kg.; at 30 fr. per 900 Kg., the freight on 30,000 Kg. = $\frac{30000}{900}$ × 30 fr. = 1000 fr.

33. Since the weight of 1000 cu. cm., or 1 cu. dm., of water is 1 Kg., the weight of 1000 cu. dm., or 1 cu. m., is 1 M.T.; hence, 58,000 cu. m. of water weigh 58,000 M.T.; then 58,000 cu. m. of stone weigh 2.7 × 58,000 M.T. = 156,600 M.T.

34. 64,000 M.T. = 64,000 × 1.1023 T., or 70,547.2 T., to Great Britain;

$\frac{1}{2}$ of 64,000 M.T., or 32,000 M.T. = 32,000 × 1.1023 T., or 35,273.6 T. to Holland.

$\frac{5}{16}$ of 64,000 M.T., or 20,000 M.T. = 20,000 × 1.1023 T., or 22,046 T., to U.S.

35. 3437 fr. = 3437 × \$.193, or \$663.341, the value of 1 Kg. of gold;
\$663.341 ÷ 32.1507 = $\$20.63^+$, the value of gold per troy oz.

36. $4\frac{1}{2}$ sq. Dm. = $4\frac{1}{2} \times 100$ sq. m., or 450 sq. m.; the rent of 450 sq. m. was 450×10 M. = 4500 M., and the entire expense = 4500 M. + 100 M., or 4600 M., which in U.S. money = $4600 \times \$.238$, or \$1094.80.

Page 171

1. \$35 = 3500 one-cent pieces, which weigh 3500×48 gr. = 168,000 gr.;
Then, the number of pounds = 168,000 gr. ÷ 7000 gr., or 24 lb.

2. 6 lb. (av.) = 6×7000 gr., or 42,000 gr.; 7 oz. = $7 \times 437\frac{1}{2}$ gr., or $3062\frac{1}{2}$ gr.; hence, 6 lb. 7 oz. $52\frac{1}{2}$ gr. = 42,000 gr. + $3062\frac{1}{2}$ gr. + $52\frac{1}{2}$ gr., or 45,115 gr. Since 100 cartridges, American, weigh 45,115 gr., 1 cartridge weighs 451.15 gr.

2 oz. = $2 \times 437\frac{1}{2}$ gr., or 875 gr.; hence, 6 lb. 2 oz. 149 gr. = 42,000 gr. + 875 gr. + 149 gr., or 43,024 gr. Since 100 cartridges, German, weigh 43,024 gr., 1 cartridge weighs 430.24 gr.

3. $3025\frac{3}{4}$ carats = $3025\frac{3}{4} \times 3.168$ gr., or 9585.576 gr.;
$1\frac{1}{4}$ lb. (av.) = $1\frac{1}{4} \times 7000$ gr., or 8750 gr.;
Then, the difference in weight = 9585.576 gr. − 8750 gr., or 835.576 gr.

4. 2 lb. (troy) = 2×5760 gr. or 11,520 gr.; 6 oz. = 6×480 gr., or 2880 gr.;
18 pwt. = 18×24 gr., or 432 gr.; hence, 2 lb. 6 oz. 18 pwt. 18 gr. = 11,520 gr. + 2880 gr. + 432 gr. + 18 gr., or 14,850 gr.;
A silver dollar contains $\frac{9}{10}$ of 412.5 gr., or 371.25 gr., of pure silver;
Therefore, the number of silver dollars = 14,850 gr. ÷ 371.25 gr., or 40.

5. 420 T. = 420×2000 lb., or 840,000 lb.; since 1 gal. of water weighs $8\frac{1}{3}$ lb., the number of gallons in 840,000 lb. = 840,000 ÷ $8\frac{1}{3}$, or 100,800 gal.

Since 1 cu. ft. = $7\frac{1}{2}$ gal., the number of cubic feet in 100,800 gal. = 100,800 ÷ $7\frac{1}{2}$, or 13,440 cu. ft.

6. Since 2 in. = $\frac{1}{6}$ ft., the quantity of water employed = $(75 \times 216 \times \frac{1}{6})$ cu. ft., or 2700 cu. ft.; and the number of gallons = $2700 \times 7\frac{1}{2}$, or 20,250 gal.

7. 890 cu. ft. = $890 \times 7\frac{1}{2}$ gal., or 6675 gal., the capacity of the tender.

8. The cubic contents of 12 bins = $12 \times (8\frac{1}{3} \times 8\frac{1}{3} \times 90)$ cu. ft. = 75,000 cu. ft.; since 1 bu. = $1\frac{1}{4}$ cu. ft., the number of bushels carried by the vessel = 75,000 ÷ $1\frac{1}{4}$, or 60,000 bu.

Page 172

9. Since 1 bu. = $1\frac{1}{4}$ cu. ft., the capacity of the elevator in bushels = 2,250,000 cu. ft. ÷ $1\frac{1}{4}$ cu. ft., or 1,800,000 bu.

10. 12 in. = 1 ft., 10 in. = $\frac{5}{6}$ ft., and $\frac{1}{2}$ in. = $\frac{1}{24}$ ft.; hence, the volume of the glass = $(1 \times \frac{5}{6} \times \frac{1}{24})$ cu. ft. Since 1 cu. ft. of water weighs $62\frac{1}{2}$ lb. and 1 cu. ft. of glass weighs $2.76 \times 62\frac{1}{2}$ lb., the weight of this piece of glass = $1 \times \frac{5}{6} \times \frac{1}{24} \times 2.76 \times 62\frac{1}{2}$ lb. = 5.989^{+} lb. or 5.99^{-} lb.

11. 6 in. = $\frac{1}{2}$ ft., 4 in. = $\frac{1}{3}$ ft., 1 in. = $\frac{1}{12}$ ft., and the volume of the block = $(\frac{1}{2} \times \frac{1}{3} \times \frac{1}{12})$ cu. ft.; the weight of the same volume of water expressed in ounces = $\frac{1}{2} \times \frac{1}{3} \times \frac{1}{12} \times 62\frac{1}{2} \times 16$ oz. = $\frac{125}{9}$ oz.; then, the specific gravity of paraffin = $12\frac{1}{2}$ oz. ÷ $\frac{125}{9}$ oz. = $\frac{9}{10}$, or .9.

12. Since 1 cu. ft. of water weighs $62\frac{1}{2}$ lb., 1 cu. ft. of ice weighs .92 of $62\frac{1}{2}$ lb., or 57.5 lb.; then, the number of cubic feet in 184 T., or 368,000 lb., of ice = 368,000 ÷ 57.5, or 6400 cu. ft., the capacity of the room. As 6400 is the product of the number of feet in each dimension of the room, the height in feet = 6400 ÷ (20 × 20), or 16 ft.

13. Since 1 cu. ft. of water weighs $62\frac{1}{2}$ lb. and since the specific gravity of the maple wood was .67, the weight of 1 cu. ft. of the maple wood was .67 × $62\frac{1}{2}$ lb., or 41.875 lb.; then, there were as many cubic feet of solid wood in the cord weighing 2814 lb. as 41.875 lb. is contained times in 2814 lb., or 67.2 cu. ft.

14. 40,000 T. = 80,000,000 lb.; since 1 cu. ft. of fresh water weighs $62\frac{1}{2}$ lb., the number of cubic feet of fresh water displaced = 80,000,000 lb. ÷ $62\frac{1}{2}$ lb., or 1,280,000 cu. ft.

Since salt water is 1.03 times as heavy as fresh water, the number of cubic feet of salt water that weigh the same as 1,280,000 cu. ft. of fresh water = 1,280,000 cu. ft. ÷ 1.03 = $1{,}242{,}718.447^-$ cu. ft.

15. The pure gold in a double eagle weighs $\frac{9}{10}$ of $21\frac{1}{2}$ pwt. = 19.35 pwt.;
The value of 1 pwt. of pure gold = $ 20 ÷ 19.35 = $ 1.03+.

16. A double eagle weighs $21\frac{1}{2}$ pwt. = $21\frac{1}{2}$ × 24 gr., or 516 gr.;
A quarter eagle weighs $\frac{1}{8}$ of 516 gr. = $64\frac{1}{2}$ gr.

17. $1,000,000 in gold = 1,000,000 ÷ 20, or 50,000, double eagles, and therefore weighs 50,000 × $21\frac{1}{2}$ pwt., or 1,075,000 pwt. = 4479 lb. 2 oz.

18. Since 77*s.* $10\frac{1}{2}$*d.*, or $934\frac{1}{2}$*d.*, in gold coin weighs 1 oz. (troy), or 480 gr., 1 sovereign, or 240*d.* in gold coin, weighs $\frac{240}{934.5} \times 480$ gr. = 123.27447+ gr; hence, the standard weight of a sovereign = 123.27447 gr.

19. Since [Ex. 18] 1 sovereign weighs 123.27447 gr., £1,000,000 in sterling money weighs 1,000,000 × 123.27447 gr., which in troy weight is 21,401 lb. 9 oz. 16 pwt. 6 gr.

20. In one hour the press stamps 60 × 80, or 4800, double eagles, which weigh 4800 × $21\frac{1}{2}$ pwt., or 103,200 pwt. = 430 lb.

21. Since U.S. gold coin is $\frac{9}{10}$ fine, the weight of pure gold in a double eagle is $\frac{9}{10}$ of $21\frac{1}{2}$ pwt., or 19.35 pwt., and in an eagle, $\frac{1}{2}$ of 19.35 pwt., or 9.675 pwt. Hence, the number of eagles that could be made from 193,704 oz., or 3,874,080 pwt., of pure gold = 3,874,080 ÷ 9.675, or 400,421 eagles and 6.825 pwt. over.

Page 174

3. 98° F. = $\frac{5}{9}(98 - 32)$ degrees centigrade = $36\frac{2}{3}$° C.

4. 30° F. = 32° − 30°, or 2° F., below the freezing point of water ; 2° F. = $2 \times \frac{5}{9}$° C. = $1\frac{1}{9}$° C.; then, 2° F. below the freezing point = $-1\frac{1}{9}$° C.

− 37.9° F. = 37.9° + 32°, or 69.9° F., below the freezing point of water; 69.9° F. = $69.9 \times \frac{5}{9}$° C. = $38\frac{5}{6}$° C. ; then, 69.9° F. below the freezing point = $-38\frac{5}{6}$° C.

5. The temperature falls 15° F. + 10° F., or 25° F.
25° F. = $25 \times \frac{5}{9}$° C. = $13\frac{8}{9}$° C.

6. 4° C. = $4 \times \frac{9}{5}$° F. + 32° F. = $39\frac{1}{5}$° F.

7. $68\frac{1}{3}$° C. = $68\frac{1}{3} \times \frac{9}{5}$° F. + 32° F. = 155° F.

8. The temperature fell 25° C. − 5° C., or 20° C. = $20 \times \frac{9}{5}$° F. = 36° F.

9. 28.7° C. = $28.7 \times \frac{9}{5}$° F. + 32° F. = 83.66° F.
25° C. = $25 \times \frac{9}{5}$° F. + 32° F. = 77° F.
83.66° F. − 77° F. = 6.66° F., the difference.

Page 175

1. Since the thickness is 2″ and the width 6″, or $\frac{1}{2}$′, each piece contains $(2 \times \frac{1}{2} \times 14)$ ft., or 14 ft., and 120 pieces contain 120 × 14 ft., or 1680 ft.

2. Since the thickness is 3″ and the width 4″, or $\frac{1}{3}$′, each piece contains $(3 \times \frac{1}{3} \times 13)$ ft., or 13 ft., and 100 pieces contain 100 × 13 ft., or 1300 ft.

3. Since the thickness is 2″ and the width 4″, or $\frac{1}{3}$′, each piece contains $(2 \times \frac{1}{3} \times 10)$ ft., or $\frac{20}{3}$ ft., and 150 pieces contain $150 \times \frac{20}{3}$ ft., or 1000 ft.

4. Since the thickness is 2″ and the width 8″, or $\frac{2}{3}$′, each piece contains $(2 \times \frac{2}{3} \times 14)$ ft., or $\frac{56}{3}$ ft., and 206 pieces contain $206 \times \frac{56}{3}$ ft., or $3845\frac{1}{3}$ ft.

5. Since the thickness is 4″ and the width 6″, or $\frac{1}{2}$′, each piece contains $(4 \times \frac{1}{2} \times 18)$ ft., or 36 ft., and 240 pieces contain 240 × 36 ft., or 8640 ft.

6. Since the thickness is 4″ and the width 4″, or $\frac{1}{3}$′, each piece contains $(4 \times \frac{1}{3} \times 12)$ ft., or 16 ft., and 160 pieces contain 160 × 16 ft., or 2560 ft.

7. Since the thickness is 4″ and the width 8″, or $\frac{2}{3}$′, each piece contains $(4 \times \frac{2}{3} \times 15)$ ft., or 40 ft., and 125 pieces contain 125 × 40 ft., or 5000 ft.

8. Since the thickness is 3″ and the width 8″, or $\frac{2}{3}$′, each piece contains $(3 \times \frac{2}{3} \times 16)$ ft., or 32 ft., and 180 pieces contain 180 × 32 ft., or 5760 ft.

9. Since the thickness is 4″ and the width 7″, or $\frac{7}{12}$′, each piece contains $(4 \times \frac{7}{12} \times 12)$ ft., or 28 ft., and 40 pieces contain 40 × 28 ft., or 1120 ft.

10. Since the thickness is 2″ and the width 12″, or 1′, each piece contains (2 × 1 × 12) ft., or 24 ft., and 480 pieces contain 480 × 24 ft., or 11,520 ft.

11. Since the thickness is 3″ and the width 10″, or $\frac{5}{6}'$, each piece contains $(3 \times \frac{5}{6} \times 22)$ ft., or 55 ft., and 36 pieces contain 36×55 ft., or 1980 ft.

12. Since the thickness is 6″ and the width 14″, or $\frac{7}{6}'$, each piece contains $(6 \times \frac{7}{6} \times 14)$ ft., or 98 ft., and 450 pieces contain 450×98 ft., or 44,100 ft.

13. Since the thickness is 4″ and the width 10″, or $\frac{5}{6}'$, each piece contains $(4 \times \frac{5}{6} \times 18)$ ft., or 60 ft., and 215 pieces contain 215×60 ft., or 12,900 ft.

14. Since the thickness is 8″ and the width 16″, or $\frac{4}{3}'$, each piece contains $(8 \times \frac{4}{3} \times 20)$ ft., or $\frac{640}{3}$ ft., and 110 pieces contain $110 \times \frac{640}{3}$ ft., or $23{,}466\frac{2}{3}$ ft.

Page 176

15. Since each board was 10 in., or $\frac{5}{6}$ ft., wide and less than 1 in. thick, it contained $(6 \times \frac{5}{6})$ ft., or 5 ft., and 4 boards contained 4×5 ft., or 20 ft.

16. The cost of 45 ft. of plain oak = $.045 \times \$30 = \$1.35$;
The cost of 10 ft. of 3-ply oak = $.010 \times \$95 = \$.95$;
The cost of 8 ft. of quartered oak = $.008 \times \$60 = \$.48$;
This cost = $\$1.35 + \$.95 + \$.48 = \$2.78$;
Since \$2.78 was $\frac{2}{11}$ of the cost, the entire cost = $\$2.78 \div \frac{2}{11} = \$15.29$.

17. A slab of ash $2\frac{3}{4}$ in. thick, 11 in., or $\frac{11}{12}$ ft., wide, and 38 in., or $\frac{38}{12}$ ft., long, contains $(\frac{11}{4} \times \frac{11}{12} \times \frac{38}{12})$ ft. of lumber, sufficient for 4 bats; since 4 bats cost $4 \times \$.08$, or \$.32, as many times 4 bats can be bought for \$46.08 as \$.32 is contained times in \$46.08, or 144; therefore the number of feet of ash necessary to fill the order = $144 \times (\frac{11}{4} \times \frac{11}{12} \times \frac{38}{12})$ ft. = $1149\frac{1}{2}$ ft.

18. 463 posts contain $463 \times (4 \times \frac{1}{3} \times 9)$ ft. = 5556 ft.;
266 stringers contain $266 \times (2 \times \frac{1}{2} \times 16)$ ft. = 4256 ft.;
3900 boards (roof) contain $3900 \times (16 \times \frac{1}{4})$ ft. = 15,600 ft.;
450 boards (sides) contain $450 \times (16 \times 1)$ ft. = 7200 ft.;
5556 ft. + 4256 ft. + 15,600 ft. + 7200 ft. = 32,612 ft., complete;
The total cost = $32.612 \times \$16 = \$521.792$, or \$521.80.

19. Since boards were placed on both sides of each row, the total length of boards for 16 rows = $16 \times 2 \times 160$ ft. = 5120 ft.; the total amount of lumber = $(5120 \times \frac{14}{12})$ ft., or $5973\frac{1}{3}$ ft., which cost $5.973\frac{1}{3} \times \$21 = \$125.44$.

20. Since each trench required 2 sets of boards, the length of boards for 40 trenches = $40 \times 2 \times 60$ ft. = 4800 ft.; the total amount of lumber = $(4800 \times \frac{16}{12})$ ft., or 6400 ft., which cost $6.400 \times \$12 = \$76.80$.

21. Sills contain $(4 \times \frac{8}{12} \times 192)$ ft. = 512 ft.;
10 posts contain $10 \times (4 \times \frac{7}{12} \times 24)$ ft. = 560 ft.;
Ties and plates contain $(4 \times \frac{6}{12} \times 522)$ ft. = 1044 ft.;
70 beams contain $70 \times (2 \times \frac{8}{12} \times 15)$ ft. = 1400 ft.;
60 beams contain $60 \times (2 \times \frac{8}{12} \times 22)$ ft. = 1760 ft.;

15 rafters contain 15 × (3 × $\frac{5}{12}$ × 20) ft. = 375 ft.;

512 ft. + 560 ft. + 1044 ft. + 1400 ft. + 1760 ft. + 375 ft. = 5651 ft., total;

The cost of the lumber = 5.651 × $20 = $113.02.

22. The piece of lumber contained (1$\frac{1}{2}$ × 1 × 12) ft., or 18 ft.; since the total length of strips was 7 × 12 ft., or 84 ft., the piece of lumber made 84 × 20 checkers, or 1680 checkers; then, the number of feet of lumber necessary for 2800 × 30 checkers, or 84,000 checkers, was as many times 18 ft. as 1680 is contained times in 84,000, that is, 84,000 ÷ 1680, or 50; hence, the amount of lumber used = 50 × 18 ft. = 900 ft.

Page 177

1. The number of pieces of slate 9″, or $\frac{3}{4}'$, wide in one row = 38 ÷ $\frac{3}{4}$ = 50$\frac{2}{3}$, or 51; the number of rows 6″, or $\frac{1}{2}'$, wide = 30 ÷ $\frac{1}{2}$, or 60, rows on one side and 2 × 60 rows, or 120 rows, altogether; hence, the total amount of slate = 120 × 51 pieces = 6120 pieces.

2. The area of both sides = 2 × (38 × 30) sq. ft. = 2280 sq. ft.;
The total weight of slate = 2280 × 4$\frac{1}{2}$ lb. = 10,260 lb.

3. From the solution of Ex. 2, the area = 2280 sq. ft. = 22.8 squares; since it took the roofer $\frac{1}{2}$ of 10 hr., or 5 hr., to finish 1 square, to finish 22.8 squares took him 22.8 × 5 hr., or 114 hr.; at 35¢ per hour, the roofer received 114 × $.35, or $39.90, for laying the roof.

4. There were 22.8 squares [Solution to Ex. 3]; then, the cost of the slate = 22.8 × $5.75 = $131.10.

5. Using the ans. to Ex. 3 and 4, the entire cost = $39.90 + $131.10 + $2.75 = $173.75.

6. The area of the roof = (80 × 32) sq. ft., or 2560 sq. ft. = 25.6 squares.
The total number of bunches = 25.6 × 4 = 102.4 bunches, or 103 bunches.

7. There are 25.6 squares [Ex. 6, solution]; hence, the cost of the roof = 25.6 × $6 = $153.60.

8. Since a shingle is 4 in. wide, the exposed surface of each = (4 × 4$\frac{1}{4}$) sq. in., or 17 sq. in. = $\frac{17}{144}$ sq. ft.; then, the number of shingles per square = 100 ÷ $\frac{17}{144}$ = 847.0+, or 847, shingles.

The area of the roof = (38 × 35) sq. ft., or 1330 sq. ft. = 13.3 squares;

The number of shingles = 13.3 × 875, or 11,637.5 shingles;

The number of bunches of 250 shingles each = 11,637.5 ÷ 250 = 46.55, or 47 bunches, the quantity purchased.

Page 178

9. The number of pieces required for 12′, or 144″, the width of the room = 144 ÷ $2\frac{1}{2}$ = $57\frac{3}{5}$, or 58 pieces.

10. Since each piece is 3″, or $\frac{1}{4}$′, wide, 14′ long [Ex. 9], and less than 1″ thick, the 58 pieces [Ex. 9, ans.] contain 58 × (14 × $\frac{1}{4}$) ft. = 203 ft., which cost .203 × $35 = $7.105, or $7.11.

11. The area of the floor = (48 × 36) sq. ft., or 1728 sq. ft.;
The amount of tiling laid per day = 20 × 2 sq. ft. = 40 sq. ft.;
The number of days required = 1728 ÷ 40, or $43\frac{1}{5}$ days.

12. The area [Ex. 11, solution] = 1728 sq. ft.; the cost = 1728 × $1.55 = $2678.40.

---

1. The distance round each room = 2 × (18 ft. + 12 ft.) = 60 ft.;
The total area of the walls = (9 × 60) sq. ft. = 540 sq. ft.;
The area of the ceiling = (18 × 12) sq. ft. = 216 sq. ft.;
The area of walls and ceiling = 540 sq. ft. + 216 sq. ft. = 756 sq. ft.;
The deductions for each room are: 2 windows 3′ 6″ by 6′, or 42 sq. ft.; and 1 door 3′ by 7′, or 21 sq. ft.; 42 sq. ft. + 21 sq. ft. = 63 sq. ft.;
The area, less deductions = 756 sq. ft. − 63 sq. ft., or 693 sq. ft. = (693 ÷ 9) sq. yd., or 77 sq. yd.; then, the area of the 4 rooms = 4 × 77 sq. yd., or 308 sq. yd.
Since 1500 laths cover 100 sq. yd., the quantity required for 308 sq. yd. = 3.08 × 1500 laths, or 4620 laths.

2. Since [Ex. 1, solution] the total area of the rooms is 308 sq. yd., the cost of putting on the laths = 308 × $.06 = $18.48.

3. Since [Ex. 1, solution] there are 308 sq. yd. to plaster, the number of days it will take for first coat = 308 sq. yd. ÷ 144 sq. yd., or $2\frac{5}{36}$ days. The plasterer can lay on $\frac{2}{3}$ of 144 sq. yd., or 96 sq. yd., of second coat per day; hence, the number of days for second coat = 308 sq. yd. ÷ 96 sq. yd., or $3\frac{5}{24}$ days. He can lay on $\frac{1}{2}$ of 144 sq. yd., or 72 sq. yd., of third coat per day; hence, the number of days for third coat = 308 sq. yd. ÷ 72 sq. yd., or $4\frac{5}{18}$ days. Therefore it will take $2\frac{5}{36}$ days + $3\frac{5}{24}$ days + $4\frac{5}{18}$ days, or $9\frac{5}{8}$ days.

4. The cost of plastering 308 sq. yd. [Ex. 1, solution] = 308 × $.33 = $101.64.

Page 179

5. The distance round the room = 2 × (30′ + 21′) = 102′;
The total area of the walls = (11 × 102) sq. ft. = 1122 sq. ft.;
The area of the ceiling = (30 × 21) sq. ft. = 630 sq. ft.;
The area of walls and ceiling = 1122 sq. ft. + 630 sq. ft. = 1752 sq. ft.;

The deductions are: $\frac{1}{2}$ for 3 windows 7′ by 3′ 9″, or $39\frac{3}{8}$ sq. ft.; and $\frac{1}{2}$ for 1 door 10′ by 10′, or 50 sq. ft.; $39\frac{3}{8}$ sq. ft. + 50 sq. ft. = $89\frac{3}{8}$ sq. ft.;

The total area, less deductions = 1752 sq. ft. – $89\frac{3}{8}$ sq. ft., or $1662\frac{5}{8}$ sq. ft. = ($1662\frac{5}{8} \div 9$) sq. yd., or $184\frac{53}{72}$ sq. yd.;

Since fireproof construction costs 70¢ – 40¢, or 30¢, more per square yard, $184\frac{53}{72}$ sq. yd. cost $184\frac{53}{72} \times$ \$.30 = \$55.42$\frac{1}{12}$, or \$55.42+, more.

6. The distance round the room = 2 × (20′ + 17′ 6″) = 75′; hence, the area of the wainscoting, less deductions = (5 × 75) sq. ft. – 75 sq. ft. = 300 sq. ft. Since 400 sq. ft. of soft wood require 1 gal. of stain, 300 sq. ft. of white pine require $\frac{3}{4}$ gal. of stain.

7. The area of the side of the house = (49 × 36) sq. ft. = 1764 sq. ft.;
Deductions are: 8 windows 3′ by 8′, or 192 sq. ft.;
The total area, less deductions = 1764 sq. ft. – 192 sq. ft., or 1572 sq. ft. = (1572 ÷ 9) sq. yd., or $174\frac{2}{3}$ sq. yd.;
$174\frac{2}{3}$ sq. yd. cost $174\frac{2}{3} \times$ \$.27, or \$47.16;
8 windows cost 8 × \$.50, or \$4.00;
The total cost = \$47.16 + \$4.00 = \$51.16.

Page 180

1. The distance round the room = 2 × (21 ft. + 18 ft.) = 78 ft.; since each strip is 18 in., or $1\frac{1}{2}$ ft., wide, the number of strips necessary, disregarding openings, is 78 ÷ $1\frac{1}{2}$, or 52 strips; but for 3 windows and 2 doors 10 strips are deducted; hence, 52 – 10, or 42 strips, are required.

2. Since [Ex. 1, ans.] 42 strips are required, the number of rolls bought = 42 ÷ 3, or 14 rolls, which cost 14 × \$.50, or \$7.

3. Since it is 78 ft. around the room [Ex. 1, solution], 78 ft. of border must be used; hence, the border costs 78 × \$.07 = \$5.46.

4. Since the paper is put on the long way, as many strips 18 in., or $1\frac{1}{2}$ ft., wide [Ex. 1] are used as $1\frac{1}{2}$ ft. is contained times in 18 ft., the width, or 12 strips; as a roll makes but 1 strip, 12 rolls are required; 12 rolls cost 12 × \$.35 = \$4.20.

5. This room is 21 ft. by 18 ft. [Ex. 1], or 7 yd. by 6 yd.; as the strips run the long way of the room they are 7 yd. in length; there are as many strips as $\frac{3}{4}$ yd. is contained times in 6 yd., or 8 strips; hence, the length of carpet needed = 8 × 7 yd., or 56 yd., and the cost = 56 × $87\frac{1}{2}$¢, or \$49.

6. The distance round the room = 2 × ($14\frac{2}{3}$′ + $12\frac{3}{4}$′) = $54\frac{5}{6}$′; as many strips 18″, or $1\frac{1}{2}$′, wide are required for a distance of $54\frac{5}{6}$′ as $1\frac{1}{2}$ is contained times in $54\frac{5}{6} = 36\frac{5}{9}$, or 37 strips; but, 9 strips are allowed for openings; hence, 37 – 9, or 28 strips, are needed for the room. The number of double rolls for 28 strips = 28 ÷ 7, or 4 double rolls, which cost 4 × \$.50, or \$2.00; the number of single rolls for 28 strips = 28 ÷ 3 = $9\frac{1}{3}$, or 10 single rolls, which cost 10 × \$.25, or \$2.50. Therefore it is \$2.50 – \$2.00, or \$.50, cheaper to use double rolls.

7. The room is 14 ft. by 18 ft., or $4\frac{2}{3}$ yd. by 6 yd.; if the matting is laid the long way the number of strips 36 in., or 1 yd., wide = $4\frac{2}{3}$, or 5 strips, making 5 × 6 yd., or 30 yd., of matting; if the matting is laid the short way the number of strips = 6, making 6 × $4\frac{2}{3}$ yd., or 28 yd., of matting. Hence, 30 yd. – 28 yd., or 2 yd., less of matting is required for the short way, and it is 2 × \$.45, or \$.90, cheaper.

8. The office floor is 24′ by 16′ 4″, or 8 yd. by $5\frac{4}{9}$ yd.; as the linoleum is laid the short way the number of strips is 8 ÷ 2, or 4 strips, having a total width of 8 yd.; then, the amount of linoleum to be purchased = (8 × $5\frac{4}{9}$) sq. yd., or $43\frac{5}{9}$ sq. yd., which costs $43\frac{5}{9}$ × \$1.17, or \$50.96.

9. The senate chamber is 20 yd. by $\frac{55}{3}$ yd.; laying the carpet the long way, the number of strips 27 in., or $\frac{3}{4}$ yd., wide = $\frac{55}{3}$ yd. ÷ $\frac{3}{4}$ yd. = $24\frac{4}{9}$, or 25 strips; hence, the total length of carpet = 25 × 20 yd., or 500 yd., costing 500 × \$2.35, or \$1175.

10. The room is $5\frac{1}{3}$ yd. by 4 yd.; the number of strips 27 in., or $\frac{3}{4}$ yd., wide = 4 yd. ÷ $\frac{3}{4}$ yd. = $5\frac{1}{3}$, or 6 strips; 6 strips $5\frac{1}{3}$ yd. long = 6 × $5\frac{1}{3}$ yd. = 32 yd.; but 9 in., or $\frac{1}{4}$ yd., is allowed for matching on every strip except the first; therefore 5 × $\frac{1}{4}$ yd., or $1\frac{1}{4}$ yd., must be added; 32 yd. + $1\frac{1}{4}$ yd. = $33\frac{1}{4}$ yd., the amount of carpet required.

The cost of the carpet = $33\frac{1}{4}$ × \$1.75 = \$58.18$\frac{3}{4}$, or \$58.19.

Page 181

1. Since each strip was 1′ by 9′, or 1 sq. yd., 80 sq. yd. made a wagon load; therefore 250 × 80 sq. yd., or 20,000 sq. yd., of sod were used.

2. The total cost per square yard = 1.6¢ + .9¢ + 2.7¢ + .6¢ = 5.8¢;
The cost of 20,000 sq. yd. [Ex. 1, ans.] = 20,000 × \$.058 = \$1160.

3. The cubic contents of the cellar = (28 × 45 × 9) cu. ft. = 420 cu. yd.;
The cost of excavating = 420 × \$.30 = \$126.

4. The volume of 40 T. of coal = 40 × 35 cu. ft. = 1400 cu. ft.; since 1400 is the product of the three dimensions of the car in feet, the number of feet in the height = 1400 ÷ (30 × 8), or $5\frac{5}{6}$ ft. = 5′ 10″.

5. The area of the sidewalk = (12 × 318) sq. ft. = 424 sq. yd.; 6 loads of sand cost 6 × \$.40 = \$2.40; since the quantity of bricks used = 424 × 38 bricks, or 16,112 bricks, their cost = 16.112 × \$7.50 = \$120.84; since the number of days for 1 man to lay the bricks = 424 sq. yd. ÷ 53 sq. yd., or 8 days, the cost for labor = 8 × \$3 = \$24;

Then, the several items of cost, in order = \$4.75 + \$2.40 + \$6 + \$3.13 + \$120.84 + \$24 = \$161.12, the total cost.

\$161.12 ÷ 424 = \$.38, the cost per square yard.

6. The area paved = (405 × 60) sq. ft. ÷ 9 = 2700 sq. yd.;
The cost per square yard = $.65 + $1.15 = $1.80;
The total cost = 2700 × $1.80 = $4860.

7. $\frac{1}{2}$ mi. = $\frac{1}{2}$ of 5280 ft., or 2640 ft., and the area of the road = (36 × 2640) sq. ft. ÷ 9 = 10,560 sq. yd., which cost 10,560 × $.98$\frac{1}{2}$ = $10,401.60.

8. The area [Ex. 7, solution] = 10,560 sq. yd.; the cost = 10,560 × $2.36 = $24,921.60.

9. 18,457 × 58 bricks = 1,070,506 bricks, the quantity laid;
1070.506 × $20 = $21,410.12, the cost of the bricks.

Page 182

10. The cubic contents of the wall = (25 × 12 × 3) cu. ft. = 900 cu. ft.;
The number of bricks required = 900 × 22$\frac{1}{2}$, or 20,250 bricks.

11. As there are 20,250 bricks [Ex. 10, ans.], the cost = 20.250 × $7.50 = $151.875, or $151.88.

12. The number of bricks = 20,250 [Ex. 10, ans.]; hence, the cost of the wall = 20.250 × $12 = $243.

13. Since 20,250 bricks are used [Ex. 10, ans.], the quantity of mortar required = 20.250 × .7 cu. yd. = 14.175 cu. yd.

14. The wall contains 900 cu. ft. [Ex. 10, solution]; it therefore weighs 900 × 125 lb. = 112,500 lb., or 56$\frac{1}{4}$ T.

15. Since the blocks are 32″, or 2$\frac{2}{3}$′, long, the number that can be placed end to end in one row = 80′ ÷ 2$\frac{2}{3}$′, or 30 blocks; since the blocks are 9″, or $\frac{3}{4}$′, thick, the number of horizontal rows = 3′ ÷ $\frac{3}{4}$′, or 4 rows; since the blocks are 12″, or 1′, in height, the number of vertical rows = 4′ ÷ 1′, or 4 rows; therefore the total number of blocks = (30 × 4 × 4), or 480 blocks, costing 480 × $.25, or $120.

16. Disregarding openings, the cubic contents of the wall = (22 × 54 × 2) cu. ft., or 2376 cu. ft.; deducting $\frac{1}{6}$ of 2376 cu. ft., or 396 cu. ft., for openings, the contents of the wall = 1980 cu. ft. = 73$\frac{1}{3}$ cu. yd. Then, the cost = 73$\frac{1}{3}$ × $25.20 = $1848.

17. The area of the top = (5 × 3) sq. ft., or 15 sq. ft.;
The area of the 2 ends = 2 × (3 × $\frac{7}{12}$) sq. ft., or 3$\frac{1}{2}$ sq. ft.;
The area of one long side = (5 × $\frac{7}{12}$) sq. ft., or 2$\frac{11}{12}$ sq. ft.;
The total area dressed = 15 sq. ft. + 3$\frac{1}{2}$ sq. ft. + 2$\frac{11}{12}$ sq. ft. = 21$\frac{5}{12}$ sq. ft.;
The cost of dressing = 21$\frac{5}{12}$ × $.50 = 10.70\frac{5}{6}$, or $10.71.

18. The wall contained (5 × 2 × 54) cu. ft. ÷ 27 = 20 cu. yd.

19. Since the wall contained 20 cu. yd. of concrete [Ex. 18, ans.], the quantity of cement = 20 × 1⅘ bbl. = 36 bbl.

36 bbl. of cement = 36 × 3¾ cu. ft. = 135 cu. ft. = 5 cu. yd.; since twice as much sand was used, the quantity of sand = 2 × 5 cu. yd. = 10 cu. yd.

Since 4 times as much broken stone was used, the quantity of broken stone = 4 × 5 cu. yd. = 20 cu. yd.

20. 36 bbl. of cement [Ex. 19, ans.] cost 36 × $2 = $72; 1 cu. yd. of sand cost 25¢ + 20¢ + 15¢, or 60¢, and 10 cu. yd. [Ex. 19, ans.] cost 10 × 60¢ = $6; 20 cu. yd. of broken stone [Ex. 19, ans.] cost 20 × 90¢ = $18; and the cost for mixing and laying 20 cu. yd. of concrete [Ex. 18, ans.] = 20 × $1 = $20; hence, the total cost = $72 + $6 + $18 + $20 = $116.

21. Since 1 cu. ft. of water weighs 62½ lb., an equal volume of clay weighs 1.2 × 62½ lb. = 75 lb.; hence, 1 cu. yd. of clay weighs 27 × 75 lb. = 2025 lb.

22. 1 cu. ft. of water weighs 62½ lb. and an equal volume of lead weighs 11.35 × 62½ lb. = 709.375 lb.; therefore 1 cu. ft. of lead is worth 709.375 × $.04½ = $31.921875, or $31.92+.

Page 183

23. Since fresh water weighs 62½ lb. per cubic foot, the man will be buoyed up by a force of 2½ × 62½ lb., or 156.25 lb., in fresh water.

The amount of salt water displaced, 2½ cu. ft., weighs 1.03 times as much as the same volume of fresh water; therefore the man's body will be buoyed up by a force of 1.03 × 156.25 lb. = 160.9375 lb., or 160.94− lb.

24. The stone displaces (5 × 2 × 1) cu. ft., or 10 cu. ft., of water, which weighs 10 × 62½ lb., or 625 lb.; since [Ex. 23] there is an upward pressure equal to the weight of water displaced, 625 lb. less force is required to lift the stone to the surface than to lift it out.

25. The timber contains (20 × 1 × 1) cu. ft., or 20 cu. ft.; the volume of the displaced water is ¾ of 20 cu. ft., or 15 cu. ft., which weighs 15 × 62½ lb., or 937½ lb.; hence, the timber weighs 937.5 lb.

Since the 20 cu. ft. of timber displaces but 15 cu. ft. of water, 1 cu. ft. of timber weighs $\frac{15}{20}$, or ¾, as much as 1 cu. ft. of water; hence, the sp. gr. is ¾, or .75.

26. Since a knot is 1.15 statute mi., 22 knots = 22 × 1.15 mi., or 25.3 mi., the rate per hour.

25.3 mi. = 25.3 × 5280 ft., or 133,584 ft.; 1 hr. = 60 min. = 60 × 60 sec., or 3600 sec.; then the rate per second = 133,584 ft. ÷ 3600 = $37\frac{8}{75}$ ft.

27. Since a knot is 1.15 statute mi., 24½ knots = 24½ × 1.15 mi. = 28.175 mi., or $28\frac{7}{40}$ mi., the rate per hour.

In a day they sail 24 × 28.175 mi., or 676.2 mi.

28. Since a knot is 1.15 statute mi., 22.27 knots = 22.27 × 1.15 mi. = 25.6105 mi., or 25.61 mi., the distance traveled per hour.

29.

$$\begin{array}{r} 28^\circ\ 14' \\ 21^\circ\ 50' \\ \hline 6^\circ\ 24' \end{array}$$

The ship sailed 6° 24′, or 384′, in 24 hr., and $\frac{1}{24}$ of 384′, or 16′, in 1 hr.; since 1′ = 1 knot (middle of p. 183), her approximate speed per hour was 16 knots.

Page 184

1. The area of one field = $(\frac{3}{4} \times \frac{1}{2})$ sq. mi. = $\frac{3}{4} \times \frac{1}{2} \times 640$ A. = 240 A.;
The area of the other = $(\frac{3}{8} \times \frac{5}{8})$ sq. mi. = $\frac{3}{8} \times \frac{5}{8} \times 640$ A. = 150 A.;
240 A. + 150 A. = 390 A., the area sown to wheat.

2. 3 plows turned $3 \times 12\frac{1}{2}$ A., or $37\frac{1}{2}$ A., per day; hence, it took as many days to plow 390 A. as $37\frac{1}{2}$ is contained times in 390, or $10\frac{2}{5}$ da.; since $\frac{2}{5}$ of a 10-hr. day is 4 hr., the time required was 10 da. 4 hr.

3. The total quantity of seed = $390 \times 5\frac{1}{2}$ pk., or 2145 pk. = (2145 ÷ 4) bu., or $536\frac{1}{4}$ bu.; $536\frac{1}{4}$ bu. of seed cost $536\frac{1}{4} \times \$.60 = \$321.75$.

4. The yield per acre = 3600 bu. ÷ 150 = 24 bu.;
The cost of thrashing = $3600 \times \$.04\frac{1}{2} = \$162$.

5. At the rate of 24 bu. of wheat per acre [Ex. 4, ans.], the larger field produced 240 × 24 bu. = 5760 bu.; since the smaller field produced 3600 bu. [Ex. 4], the whole yield = 5760 bu. + 3600 bu. = 9360 bu.

6. The amount reaped per hour = 27 × 2 bu. = 54 bu.; the amount per day = 10 × 54 bu. = 540 bu.; then, the number of days required to reap 5760 bu. = $5760 \div 540 = 10\frac{2}{3}$ days.

Page 185

7. This item of expense = $9360 \times \$.01\frac{1}{2} = \$140.40$.

8. Since 18 cars carried 9360 bu. [Ex. 7], one car carried $\frac{1}{18}$ of 9360 bu., or 520 bu., which weighed 520 × 60 lb. = 31,200 lb.

9. From Ex. 7 and 8, 9360 bu. weighed 9360 × 60 lb. = 561,600 lb. = 5616 cwt.; hence, the rate per 100 lb. = $1010.88 ÷ 5616 = 18¢.

10. The time from Aug. 8 to Sept. 16 inclusive = 40 days; then the entire charge per bushel = $\frac{3}{4}$¢ for the first 10 days plus $3 \times \frac{3}{8}$¢, or $1\frac{1}{8}$¢, for the last 30 days = $1\frac{7}{8}$¢; $9360 \times \$.01\frac{7}{8} = \$175.50$, the cost of storing the wheat.

11. 9360 bu. [Ex. 7] sold for 9360 × $.65 = $6084;
$6084 − $2885.75 = $3198.25, the total gain.

12. The cost by water = $9360 \times \$.04\frac{3}{4} = \$444.60$; since [Ex. 8] the wheat weighed 9360 × 60 lb. = 561,600 lb., or 5616 cwt., the cost by rail = 5616 × $.16 = $898.56: hence, the charges by rail would have been $898.56 − $444.60, or $453.96, more.

13. From Ex. 8 the wheat weighed 9360 × 60 lb. = 561,600 lb.; the flour weighed 4 lb. more than 2063 × 196 lb.. or 404,352 lb.; 404,352 lb. ÷ 561,600 lb. = .72; that is, the weight of the flour was .72 of the weight of the wheat.

14. Since 196 lb. of flour [Ex. 13] was .72 of the weight of the wheat from which it was made [Ex. 13, ans.], the wheat necessary for 1 bbl. of flour = 196 lb. ÷ .72 = 272$\frac{2}{9}$ lb.; since 1 bu. of wheat weighs 60 lb. [Ex. 8], the number of bushels in 272$\frac{2}{9}$ lb. = 272$\frac{2}{9}$ ÷ 60 = 4.537 + bu., or 4.54 bu.

15. From Ex. 13, 5 bbl. of flour weigh 5 × 196 lb. = 980 lb.; since 980 lb. ÷ 100 lb. = 9.8, 980 lb. of flour will make 9.8 × 135 loaves, or 1323 loaves.

16. Great Britain, 25 × 31.8 bu. = 795 bu.
France, 25 × 26 bu. = 650 bu.
Germany, 25 × 19.4 bu. = 485 bu.
Austria, 25 × 16.4 bu. = 410 bu.
United States, 25 × 13.4 bu. = 335 bu.
Russia, 25 × 9 bu. = 225 bu.

17. These states produced 68,000,000 bu. + 65,000,000 bu. + 54,000,000 bu. = 187,000,000 bu.; if 187,000,000 bu. was .34 of the entire crop, we produced 187,000,000 bu. ÷ .34, or 550,000,000 bu.

Page 186

18. He earned 156 × $1.85 = $288.60.

19. Each man earned 156 × $2.25 = $351;
Their combined wages = 34 × $351 = $11,934.

20. One man's total wages = $3853.20 ÷ 13 = $296.40;
Each received per day $296.40 ÷ 156, or $1.90.

21. Their combined wages per month = $45 + $30 + $45 = $120;
Their combined wages for 6 mo. = 6 × $120 = $720.

22. The total wages of each = 12 × 6 × $1.50 = $108;
The total wages of all = 23 × $108 = $2484.

23. The total wages of each = $3123.75 ÷ 17 = $183.75;
The daily wage of each = $183.75 ÷ 35 = $5.25.

24. The total wages of the men [Ex. 18–23] = $288.60 + $11,934 + $3853.20 + $720 + $2484 + $3123.75 = $22,403.55.

25. Their total daily wage = $2.55 + $2 + $5.50 = $10.05;
The cost of this labor = 184 × $10.05 = $1849.20.

Page 187

26. 184 × $3.75 = $690, the sawyer's earnings;
$\frac{8}{15}$ of $690 = $368, his assistant's earnings.

27. Their total daily wage = $2.75 plus 2 × $2 = $6.75;
They received during the season 184 × $6.75 = $1242.

28. Their total daily wage was 2 × $2 plus 2 × $1.85, or $7.70;
Their wages for the season = 184 × $7.70 = $1416.80.

29. In one day they together received $690 ÷ 184, or $3.75; the boy received $\frac{2}{5}$ of $3.75, or $1.50, the man $3.75 − $1.50, or $2.25.

30. In one day the engineer and fireman received $3.50 + $2.25, or $5.75; in 184 days they received 184 × $5.75, or $1058.

31. 12 lumber handlers received per day 12 × $1.85, or $22.20; the total earnings per day = $6.50 + $2 + $3.50 + $2.50 + $22.20 = $36.70; the total earnings in 184 days = 184 × $36.70 = $6752.80.

32. From Ex. 25–31, the wages in the mill = $1849.20 + $690 + $368 + $1242 + $1416.80 + $690 + $1058 + $6752.80 = $14,066.80.

33. The output for 184 days = 184 × 95,000 ft. = 17,480,000 ft.

34. To transport 95,000 ft. of lumber [Ex. 33] cost 95.000 × $1.75 = $166.25.
To transport the season's output cost 184 × $166.25 = $30,590.

35. $\frac{3}{5}$ of 95,000 ft. = 57,000 ft., which sold for 57.000 × $22.25 = $1268.25;
$\frac{1}{10}$ of 95,000 ft. = 9500 ft., which sold for 9.500 × $28.75 = $273.125;
The rest, 28,500 ft., sold for 28.500 × $19.75 = $562.875;
The value of one day's output = $1268.25 + $273.125 + $562.875 = $2104.25.

36. In 184 days the receipts = 184 × $2104.25 = $387,182.

Page 188

37. 12 ft. = 4 yd., 18 ft. = 6 yd., and 720 ft. = 240 yd.; then the quantity of material removed = (4 × 6 × 240) cu. yd. = 5760 cu. yd.

38. The cost for 5760 cu. yd. [Ex. 37, ans.] = 5760 × $3.75 = $21,600.

39. Since 292 ft. of shaft were sunk in 365 days, 720 ft. required $\frac{720}{292}$ of 365 days, or 900 days.

40. At a cost of $.90 + $3.60, or $4.50, per lineal yard 567 ft., or 189 yd., of tunnel cost 189 × $4.50 = $850.50.

41. Each loaded car weighed 850 lb. + 2240 lb. = 3090 lb.;
8 loaded cars weighed 8 × 3090 lb. = 24,720 lb.

42. Since the track had 2 parallel rails there were 2 × 180 yd., or 360 yd., of rails, whose weight was 360 × 35 lb., or 12.600 lb. = (12,600 ÷ 2240) long tons = $5\frac{5}{8}$ long tons; hence, the cost of the rails = $5\frac{5}{8}$ × $13.20 = $74.25.

43. It took as many seconds to reach the surface as 24 ft. is contained times in 720 ft., or 30 sec.

44. They earn together $5\frac{1}{2}$ × $.69, or 3.79\frac{1}{2}$;
The miner's earnings per day = $\frac{2}{3}$ of 3.79\frac{1}{2}$ = $2.53.
The laborer's earnings per day = $\frac{1}{3}$ of 3.79\frac{1}{2}$ = 1.26\frac{1}{2}$.

45. Since the miner earned $2.53 per day [Ex. 44, ans.], his share of the earnings in November = 24 × $2.53 = $60.72.

46. Since [Ex. 45] 24 × $5\frac{1}{2}$ T., or 132 T., were mined in November, the amount of powder required = 132 × $10\frac{2}{3}$ oz., or 1408 oz. = (1408 ÷ 16) lb., or 88 lb. Since 25 lb. of powder cost $1.50, 88 lb. cost $\frac{88}{25}$ of $1.50, or $5.28.

Page 189

47. Lard oil cost $1\frac{3}{8}$ × $.48, or $.66; the total expenses, including the cost of powder [Ex. 46, ans.], = $5.28 + $.18 + $.96 + $.15 + $.66 = $7.23.

48. $60.72 less expenses, $7.23 [Ex. 47, ans.], = $53.49, net earnings.

49. The cost for the locomotive per day = $4.25 + $.50 + $.60 = $5.35;
The cost for 24 days = 24 × $5.35 = $128.40.

50. The cost of mule power per day = $9 + $7.25 = $16.25;
The cost for 24 days = 24 × $16.25 = $390.

51. The amount saved [Ex. 49 and 50, ans.] = $390 − $128.40 = $261.60.

52. In one day all received $\frac{1}{6}$ of $219.30, or $36.55;
Each received per day $36.55 ÷ 43, or $.85.

53. Since $\frac{3}{16}$ of the coal was lost, $\frac{13}{16}$ was secured; if $\frac{13}{16}$ was 1365 L.T., the amount mined in one day = 1365 L.T. ÷ $\frac{13}{16}$ = 1680 L.T.; then the loss = 1680 L.T. − 1365 L.T. = 315 L.T.

54. The expense per ton = $2.08 + $.96 = $3.04;
The profit per ton = $3.40 − $3.04 = $.36;
The total profits = 850 × $.36 = $306.

55. He bought the coal at $3.40 per long ton [Ex. 54]; the entire cost per ton = $3.40 + $.85 + $.75 = $5; the cost of all the coal = 850 × $5 = $4250; 850 L.T. = 850 × 2240 lb., or 1,904,000 lb., = (1,904,000 ÷ 2000) short tons, or 952 T., which sold for 952 × $6.25 = $5950; he therefore gained $5950 − $4250, or $1700.

56. The output the next year = 36,940,710 T. + 23,301,750 T. = 60,242,460 T.

Page 190

57. In 24 hr. it picks up 24 × 85 × $1\frac{1}{2}$ T. = 3060 T.

58. Since [Ex. 57] the amount of earth dredged per day = 24 × 85 cu. yd. = 2040 cu. yd., the value of the gold = 2040 × $.17$\frac{1}{2}$ = $357.

59. Since the value of the gold dredged in one day is $357 [Ex. 58, ans.], the value of that dredged in 365 days = 365 × $357 = $130,305.

60. To dredge 12½ A. takes 12½ × 11 days, or 137½ days; since $357 is the value of one day's work, 137½ × $357, or $49,087.50, is the value of the gold from 12½ A.

61. The expense of sinking the shaft = 102 × $16.75 = $1708.50.

62. The total length of the drifts = 184 ft. + 213 ft. + 230 ft. + 180 ft. + 98 ft. + 198 ft. + 41 ft. + 156 ft. = 1304 ft.

63. No. 1 powder cost 1015 × $.16 = $162.40;
No. 2 powder cost 12,760 × $.12 = $1531.20;
The cost of powder = $162.40 + $1531.20 = $1693.60.

64. At $.52 per 1000 ft., 37,500 ft. of fuse cost 37.500 × $.52 = $19.50;
The caps cost 98 × $.60 = $58.80;
The cost of fuse and caps = $19.50 + $58.80 = $78.30.

Page 191

65. The cost per pound = $114 ÷ 1520 = $.075, or 7½¢.

66. The wood cost 167½ × $5 = $837.50;
5800 lb. of coal = (5800 ÷ 2000) T., or 2.9 T., costing 2.9 × $15 = $43.50,
The cost of fuel = $837.50 + $43.50 = $881.

67. The total expenses, including those found in Ex. 63-66, = $1693.60 + $78.30 + $114 + $881 + $9750.75 + $216.46 + $85.86 + $283.86 + $414.26 + $521.23 + $148.21 = $14,187.52.

68. Since the total cost = $14,187.52 [Ex. 67, ans.], the cost per foot of drift = $14,187.52 ÷ 1304 = $10.88.

69. Each day 2 foremen received 2 × $4 = $8; 2 brakemen, 2 × $2.50 = $5; 36 miners, 36 × $2.75 = $99; 2 smiths, 2 × $4 = $8; 2 smith's helpers, 2 × $2 = $4; 8 laborers, 8 × $2.50 = $20; their total wages per day = $8 + $5 + $99 + $8 + $4 + $20 = $144. Then their combined wages during a month = 26 × $144 = $3744.

70. $3744 for labor [Ex. 69, ans.] + $249.15 for implements + $265.25 for materials = $4258.40, the total expense.

71. Since the total expense of mining was $4258.40 [Ex. 70, ans.], the expense per ton = $4258.40 ÷ 1020 = $4.17.

72. The total cost of milling = 1020 × $2.48 = $2529.60.

73. The expense of mining per ton $4.17 [Ex. 71, ans.] + the expense of milling per ton, $2.48 [Ex. 72] = $6.65, the entire expense per ton.

The expense of mining and milling 1020 T. = 1020 × $6.65 = $6783.

74. 1020 T. of ore yielded $1020 \times \frac{2}{3}$ oz., or 680 oz., of gold, which in troy weight = $(680 \div 12)$ lb. = $56\frac{2}{3}$ lb.

75. 680 oz. of gold [Ex. 74, solution] was worth $680 \times \$20.67$, or \$14,055.60.

76. The value of the gold, \$14,055.60 [Ex. 75, ans.], exceeded the cost of mining and milling, \$6783 [Ex. 73, ans.], by \$14,055.60 – \$6783, or \$7272.60.

77. The saving per horse power = \$21 – \$7 = \$14;
The saving on 1370 horse power = $1370 \times \$14$ = \$19,180.

Page 195

12. The number of works of fiction = 22%, or .22, of 8400 = 1848.

13. The hospital received $37\frac{1}{2}$%, or $\frac{3}{8}$, of \$240,000 = \$90,000.

14. The quantity of iron = 70%, or .70, of 2240 lb. = 1568 lb.

15. The amount of red fir = 66%, or .66, of 12,200 ft. = 8052 ft.
The amount of pine = 18%, or .18, of 12,200 ft. = 2196 ft.
The amount of spruce = 5%, or .05, of 12,200 ft. = 610 ft.
The amount of hemlock = 5%, or .05, of 12,200 ft. = 610 ft.
The amount of cedar = 2%, or .02, of 12,200 ft. = 244 ft.
The amount of other kinds = 4%, or .04, of 12,200 ft. = 488 ft.

16. The graph indicates Great Britain's share to be $18\frac{1}{2}$%;
$18\frac{1}{2}$%, or $.18\frac{1}{2}$, of \$21,900,000,000 = \$4,051,500,000, Great Britain's share.
The graph indicates Germany's share to be $11\frac{1}{2}$%;
$11\frac{1}{2}$%, or $.11\frac{1}{2}$, of \$21,900,000,000 = \$2,518,500,000, Germany's share.
The graph indicates the share of the U.S. to be 11%;
11%, or .11, of \$21,900,000,000 = \$2,409,000,000, the share of the U.S.
The graph indicates France's share to be $7\frac{1}{2}$%;
$7\frac{1}{2}$%, or $.07\frac{1}{2}$, of \$21,900,000,000 = \$1,642,500,000, France's share.
The graph indicates the share of The Netherlands to be 7%;
7%, or .07, of \$21,900,000,000 = \$1,533,000,000, the share of The Netherlands.
The graph indicates Belgium's share to be 4%;
4%, or .04, of \$21,900,000,000 = \$876,000,000, Belgium's share.
The graph indicates Russia's share to be $3\frac{1}{2}$%;
$3\frac{1}{2}$%, or $.03\frac{1}{2}$, of \$21,900,000,000 = \$766,500,000, Russia's share.

17. The imports amounted to 100% – $57\frac{1}{2}$%, or $42\frac{1}{2}$%.

Since the commerce of the U.S. amounted to \$2,409,000,000 [Ex. 16, ans.], the value of the imports = $42\frac{1}{2}$%, or $.42\frac{1}{2}$, of \$2,409,000,000 = \$1,023,825,000.

The value of the exports = \$2,409,000,000 – \$1,023,825,000 = \$1,385,175,000.

Page 196

2. $\$14 \div \$60 = .23\frac{1}{3}$; that is, \$14 is $.23\frac{1}{3}$, or $23\frac{1}{3}\%$, of \$60.

3. $\$60 \div \$75 = .80$; that is, \$60 is .80, or 80%, of \$75.

4. $\$16 \div \$14 = 1.14\frac{2}{7}$; that is, \$16 is $1.14\frac{2}{7}$, or $114\frac{2}{7}\%$, of \$14.

5. $\$14 \div \$16 = \frac{7}{8}$; that is, \$14 is $\frac{7}{8}$, or $87\frac{1}{2}\%$, of \$16.

6. $\$32 \div \$1600 = .02$; that is, \$32 is .02, or 2%, of \$1600.

7. 900 yd. ÷ 150 yd. = 6; that is, 900 yd. is 6 times, or 600% of, 150 yd.

8. 150 yd. ÷ 900 yd. = $\frac{1}{6}$; that is, 150 yd. is $\frac{1}{6}$, or $16\frac{2}{3}\%$, of 900 yd.

9. 2 hr. 40 min. = $2\frac{2}{3}$ hr.; $2\frac{2}{3}$ hr. ÷ 8 hr. = $\frac{1}{3}$; that is, 2 hr. 40 min. is $\frac{1}{3}$, or $33\frac{1}{3}\%$, of 8 hr.

10. $\frac{1}{5} \div 30 = \frac{1}{150} = .00\frac{2}{3}$; that is, $\frac{1}{5}$ is $.00\frac{2}{3}$, or $\frac{2}{3}\%$, of 30.

11. $\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$; that is, $\frac{1}{4}$ is $\frac{1}{2}$, or 50%, of $\frac{1}{2}$.

12. $.625 \div 1 = .625$; that is, .625 is .625, or $62\frac{1}{2}\%$, of 1.

13. $.12\frac{1}{2} \div .75 = \frac{1}{6}$; that is, $.12\frac{1}{2}$ is $\frac{1}{6}$, or $16\frac{2}{3}\%$, of .75.

Page 197

14. $2500 \div 6000 = .41\frac{2}{3}$; that is, 2500 is $.41\frac{2}{3}$, or $41\frac{2}{3}\%$, of 6000;
Hence, $41\frac{2}{3}\%$ is in New York.
$900 \div 6000 = .15$; that is, 900 is .15, or 15%, of 6000;
Hence, 15% is in Illinois.

15. The total yield of cocoa = 1000 × $1\frac{3}{4}$ lb. = 1750 lb.;
910 lb. ÷ 1750 lb. = .52; that is, 910 lb. is .52, or 52%, of 1750 lb.;
Hence, 52% of the cocoa is cocoa butter.

16. 9,000,000 bu. ÷ 20,000,000 bu. = .45; that is, 9,000,000 bu. is .45, or 45%, of 20,000,000 bu. Hence, 45% of the wheat went to Great Britain.

17. $88\frac{1}{2}$ lb. ÷ 150 lb. = .59; that is, $88\frac{1}{2}$ lb. is .59, or 59%, of 150 lb.;
Hence, 59% was graphite, and 100% − 59%, or 41%, was clay.

18. Its loss in weight = 279 carats − 106 carats, or 173 carats;
$173 \div 279 = .62^{+}$; that is, 173 carats is .62, or 62%, of 279 carats;
Hence, the loss in weight was 62%.

19. $575{,}000 \div 1{,}345{,}000 = .428^{-}$; that is, 575,000 is .428, or 42.8%, of 1,345,000. Hence, the number of volumes in the New York State Library is 42.8% of the number in the Library of Congress.

20. Adding the columns in the table, the population = 1,594,100,000;
$105{,}806{,}000 \div 1{,}594{,}100{,}000 = .066^{+}$; that is, 105,806,000 is .066, or 6.6%, of 1,594,100,000. Hence, the population of North America is 6.6% of the population of the world.

38,482,000 ÷ 1,594,100,000 = .024+; that is, 38,482,000 is .024, or 2.4%, of 1,594,100,000. Hence, the population of South America is 2.4% of the population of the world.

396,406,000 ÷ 1,594,100,000 = .249−; that is, 396,406,000 is .249, or 24.9%, of 1,594,100,000. Hence, the population of Europe is 24.9% of the population of the world.

906,674,000 ÷ 1,594,100,000 = .569−; that is, 906,674,000 is .569, or 56.9%, of 1,594,100,000. Hence, the population of Asia is 56.9% of the population of the world.

140,274,000 ÷ 1,594,100,000 = .088−; that is, 140,274,000 is .088, or 8.8%, of 1,594,100,000. Hence, the population of Africa is 8.8% of the population of the world.

6,458,000 ÷ 1,594,100,000 = .004+; that is, 6,458,000 is .004, or .4%, of 1,594,100,000. Hence, the population of Australia, etc., is .4% of the population of the world.

Adding the columns in the table, the area = 52,406,000 sq. mi.;

9,430,000 sq. mi. ÷ 52,406,000 sq. mi. = .1799+, or .180−; that is, 9,430,000 sq. mi. is .180, or 18.0%, of 52,406,000 sq. mi. Hence, the area of North America is 18.0% of the total land area.

6,856,000 sq. mi. ÷ 52,406,000 sq. mi. = .131−; that is, 6,856,000 sq. mi. is .131, or 13.1%, of 52,406,000 sq. mi. Hence, the area of South America is 13.1% of the total land area.

3,842,000 sq. mi. ÷ 52,406,000 sq. mi. = .073+; that is, 3,842,000 sq. mi. is .073, or 7.3%, of 52,406,000 sq. mi. Hence, the area of Europe is 7.3% of the total land area.

17,056,000 sq. mi. ÷ 52,406,000 sq. mi. = .325+; that is, 17,056,000 sq. mi. is .325, or 32.5%, of 52,406,000 sq. mi. Hence, the area of Asia is 32.5% of the total land area.

11,512,000 sq. mi. ÷ 52,406,000 sq. mi. = .2196+, or .220−; that is, 11,512,000 sq. mi. is .220, or 22.0%, of 52,406,000 sq. mi. Hence, the area of Africa is 22.0% of the total land area.

3,456,000 sq. mi. ÷ 52,406,000 sq. mi. = .066−; that is, 3,456,000 sq. mi. is .066, or 6.6%, of 52,406,000 sq. mi. Hence, the area of Australia, etc., is 6.6% of the total land area.

254,000 sq. mi. ÷ 52,406,000 sq. mi. = .005−; that is, 254,000 sq. mi. is .005, or .5%, of 52,406,000 sq. mi. Hence, the area of the South Polar Lands is .5% of the total land area.

21. Great Britain's share of the total commerce was 18½%.

Germany's share was 11½%; since 11½% ÷ 18½% = .622−, the commerce of Germany was .622, or 62.2%, of that of Great Britain.

The share of the U.S. was 11%; since $11\% \div 18\frac{1}{2}\% = .595^-$, the commerce of the U.S. was .595, or 59.5%, of that of Great Britain.

The share of France was $7\frac{1}{2}\%$; since $7\frac{1}{2}\% \div 18\frac{1}{2}\% = .405^+$, the commerce of France was .405, or 40.5%, of that of Great Britain.

The share of The Netherlands was 7%; since $7\% \div 18\frac{1}{2}\% = .378^+$, the commerce of The Netherlands was .378, or 37.8%, of that of Great Britain.

Belgium's share was 4%; since $4\% \div 18\frac{1}{2}\% = .216^+$, the commerce of Belgium was .216, or 21.6%, of that of Great Britain.

The share of Russia and Finland was $3\frac{1}{2}\%$; since $3\frac{1}{2}\% \div 18\frac{1}{2}\% = .189^+$, the commerce of Russia and Finland was .189, or 18.9%, of that of Great Britain.

Of the total commerce the share of the U.S. was 11%.

Great Britain's share was $18\frac{1}{2}\%$; since $18\frac{1}{2}\% \div 11\% = 1.682^-$, the commerce of Great Britain was 1.682, or 168.2%, of that of the U.S.

Germany's share was $11\frac{1}{2}\%$; since $11\frac{1}{2}\% \div 11\% = 1.045^+$, the commerce of Germany was 1.045, or 104.5%, of that of the U.S.

France's share was $7\frac{1}{2}\%$; since $7\frac{1}{2}\% \div 11\% = .682^-$, the commerce of France was .682, or 68.2%, of that of the U.S.

The share of The Netherlands was 7%; since $7\% \div 11\% = .636^+$, the commerce of The Netherlands was .636, or 63.6%, of that of the U.S.

Belgium's share was 4%; since $4\% \div 11\% = .364^-$, the commerce of Belgium was .364, or 36.4%, of that of the U.S.

The share of Russia and Finland was $3\frac{1}{2}\%$; since $3\frac{1}{2}\% \div 11\% = .318^+$, the commerce of Russia and Finland was .318, or 31.8%, of that of the U.S.

Page 199

3. Let $x =$ the number.
Then, $.91\,x = \$2184,$
and $x = \$2184 \div .91 = \$2400.$

4. Let $x =$ the number.
Then, $.02\frac{1}{4}\,x = \$864,$
and $x = \$864 \div .0225 = \$38{,}400.$

5. Let $x =$ the number.
Then, $.62\frac{1}{2}\,x$, or $\frac{5}{8}\,x = 5500,$
and $x = 5500 \div \frac{5}{8} = 8800.$

6. Let $x =$ the number.
Then, $.15\,x = \$63.90,$
and $x = \$63.90 \div .15 = \$426.$

7. Let $x =$ the number.
Then, $.05\,x = \$2.25,$
and $x = \$2.25 \div .05 = \$45.$

8. Let $x =$ the number.
Then, $.33\frac{1}{3}x$, or $\frac{1}{3}x = \$5.73$,
and $x = \$5.73 \div \frac{1}{3} = \$17.19$.

9. Let $x =$ the number.
Then, $.87\frac{1}{2}x$, or $\frac{7}{8}x = 1365$,
and $x = 1365 \div \frac{7}{8} = 1560$.

10. Let $x =$ the number.
Then, $.06\frac{1}{4}x = 5200$,
and $x = 5200 \div .0625 = 83{,}200$.

11. Let $x =$ the number.
Then, $.62\frac{1}{2}x$, or $\frac{5}{8}x = 4525$,
and $x = 4525 \div \frac{5}{8} = 7240$.

12. Let $x =$ the total number of acres.
Then, $.58x = 319$,
and $x = 319 \div .58 = 550$, the total number of acres.

13. Let $x =$ the total number of barrels.
Then, $.72x = 18{,}000{,}000$,
and $x = 18{,}000{,}000 \div .72 = 25{,}000{,}000$, the total number of barrels.

14. Let $x =$ the number of tons produced.
Then, $.84x = 37{,}800$,
and $x = 37{,}800 \div .84 = 45{,}000$, the total number of tons.

15. Let $x =$ the entire number of coaches.
Then, $.485x = 13{,}580$,
and $x = 13{,}580 \div .485 = 28{,}000$, the total number of coaches.

16. Let $x =$ the total number of immigrants.
Then, $.186x = 151{,}590$,
and $x = 151{,}590 \div .186 = 815{,}000$, the total number.

17. Let $x =$ the area of Lake Superior in square miles.
Then, $.32x = 9960 + 24 = 9984$,
and $x = 9984 \div .32 = 31{,}200$, the area in square miles.

18. Let $x =$ the income in dollars.
Then, $.15x = .25$ of $\$1{,}875{,}000 = \$468{,}750$,
and $x = \$468{,}750 \div .15 = \$3{,}125{,}000$, the income.

19. The graph indicates the production of the U.S. to be 32%.
Let $x =$ the production of the world in tons.
Then, $.32x = 352{,}000{,}000$,
and $x = 352{,}000{,}000 \div .32 = 1{,}100{,}000{,}000$, the total number of tons.

The graph indicates the production of Great Britain and Ireland to be $62\% - 32\%$, or 30%, of the total production $= 30\%$, or $.30$, of 1,100,000,000 T. $= 330{,}000{,}000$ T.

The graph indicates the production of Germany to be $82\% - 62\%$, or 20%, of the total production $= 20\%$, or $\frac{1}{5}$, of 1,100,000,000 T. $= 220{,}000{,}000$ T.

Page 200

1. 4800 increased by $16\frac{2}{3}\%$, or $\frac{1}{6}$, of itself $= 4800 + 800 = 5600$.

2. 1800 decreased by $37\frac{1}{2}\%$, or $\frac{3}{8}$, of itself $= \frac{5}{8}$ of $1800 = 1125$.

3. $\$2.50$ less 40%, or $\frac{2}{5}$, of itself $= \frac{3}{5}$ of $\$2.50 = \$1.50$, the decreased cost.

4. 13,600 increased by $87\frac{1}{2}\%$, or $\frac{7}{8}$, of itself $= 1\frac{7}{8}$ of $13{,}600 = 25{,}500$, the number of farms at the beginning of this century.

5. The increase in number $= 17{,}010{,}000 - 13{,}500{,}000 = 3{,}510{,}000$; $3{,}510{,}000 \div 13{,}500{,}000 = .26$; that is, 3,510,000 is .26, or 26%, of 13,500,000. Hence, the increase was 26%.

6. The decrease in tonnage $= 450{,}000$ T. $- 225{,}000$ T. $= 225{,}000$ T.; $225{,}000$ T. $\div 450{,}000$ T. $= \frac{1}{2}$; that is, 225,000 T. is $\frac{1}{2}$, or 50%, of 450,000 T. Hence, the decrease was 50%.

7. 20,904 T. decreased by $12\frac{1}{2}\%$, or $\frac{1}{8}$, of itself $= 20{,}904$ T. $- 2613$ T. $=$ 18,291 T., the actual weight of the currants.

8. 48 lb. less $33\frac{1}{3}\%$, or $\frac{1}{3}$, of itself $= 48$ lb. $- 16$ lb. $= 32$ lb., its weight after boiling; 32 lb. less 25%, or $\frac{1}{4}$, of itself $= 32$ lb. $- 8$ lb. $= 24$ lb., its final weight.

Page 201

9. The decrease in price $= \$40 - \$16.60 = \$23.40$; $\$23.40 \div \$40 = .58\frac{1}{2}$; that is, $\$23.40$ is $.58\frac{1}{2}$, or $58\frac{1}{2}\%$, of $\$40$. Hence, the decrease was $58\frac{1}{2}\%$.

10. $\$4.17$ less 55% of itself $= 100\% - 55\%$, or 45%, of $\$4.17 = \$1.8765$, or $\$1.88$, the average value in Illinois.

$\$4.17$ plus 111% of itself $= 100\% + 111\%$, or 211%, of $\$4.17 = \$8.7987$, or $\$8.80$, the average value in New York.

Page 202

3. Since 138 is equal to a certain number increased by 15% of itself, 138 is 115% of the number, or 1.15 times the number.

Hence, the number $= 138 \div 1.15 = 120$.

4. Since 365 is equal to a certain number increased by 25% of itself, 365 is 125%, or $\frac{5}{4}$, of the number; hence, the number $= 365 \div \frac{5}{4} = 292$.

13. From Ex. 8 the wheat weighed 9360 × 60 lb. = 561,600 lb.; the flour weighed 4 lb. more than 2063 × 196 lb.. or 404,352 lb.; 404,352 lb. ÷ 561,600 lb. = .72; that is, the weight of the flour was .72 of the weight of the wheat.

14. Since 196 lb. of flour [Ex. 13] was .72 of the weight of the wheat from which it was made [Ex. 13, ans.], the wheat necessary for 1 bbl. of flour = 196 lb. ÷ .72 = $272\frac{2}{9}$ lb.; since 1 bu. of wheat weighs 60 lb. [Ex. 8], the number of bushels in $272\frac{2}{9}$ lb. = $272\frac{2}{9}$ ÷ 60 = 4.537+ bu., or 4.54 bu.

15. From Ex. 13, 5 bbl. of flour weigh 5 × 196 lb. = 980 lb.; since 980 lb. ÷ 100 lb. = 9.8, 980 lb. of flour will make 9.8 × 135 loaves, or 1323 loaves.

16. Great Britain, 25 × 31.8 bu. = 795 bu.
France, 25 × 26 bu. = 650 bu.
Germany, 25 × 19.4 bu. = 485 bu.
Austria, 25 × 16.4 bu. = 410 bu.
United States, 25 × 13.4 bu. = 335 bu.
Russia, 25 × 9 bu. = 225 bu.

17. These states produced 68,000,000 bu. + 65,000,000 bu. + 54,000,000 bu. = 187,000,000 bu.; if 187,000,000 bu. was .34 of the entire crop, we produced 187,000,000 bu. ÷ .34, or 550,000,000 bu.

Page 186

18. He earned 156 × $1.85 = $288.60.

19. Each man earned 156 × $2.25 = $351;
Their combined wages = 34 × $351 = $11,934.

20. One man's total wages = $3853.20 ÷ 13 = $296.40;
Each received per day $296.40 ÷ 156, or $1.90.

21. Their combined wages per month = $45 + $30 + $45 = $120;
Their combined wages for 6 mo. = 6 × $120 = $720.

22. The total wages of each = 12 × 6 × $1.50 = $108;
The total wages of all = 23 × $108 = $2484.

23. The total wages of each = $3123.75 ÷ 17 = $183.75;
The daily wage of each = $183.75 ÷ 35 = $5.25.

24. The total wages of the men [Ex. 18–23] = $288.60 + $11,934 + $3853.20 + $720 + $2484 + $3123.75 = $22,403.55.

25. Their total daily wage = $2.55 + $2 + $5.50 = $10.05;
The cost of this labor = 184 × $10.05 = $1849.20.

Page 187

26. 184 × $3.75 = $690, the sawyer's earnings;
$\frac{8}{15}$ of $690 = $368, his assistant's earnings.

27. Their total daily wage = $2.75 plus 2 × $2 = $6.75;
They received during the season 184 × $6.75 = $1242.

28. Their total daily wage was 2 × $2 plus 2 × $1.85, or $7.70;
Their wages for the season = 184 × $7.70 = $1416.80.

29. In one day they together received $690 ÷ 184, or $3.75; the boy received $\frac{2}{5}$ of $3.75, or $1.50, the man $3.75 – $1.50, or $2.25.

30. In one day the engineer and fireman received $3.50 + $2.25, or $5.75; in 184 days they received 184 × $5.75, or $1058.

31. 12 lumber handlers received per day 12 × $1.85, or $22.20; the total earnings per day = $6.50 + $2 + $3.50 + $2.50 + $22.20 = $36.70; the total earnings in 184 days = 184 × $36.70 = $6752.80.

32. From Ex. 25–31, the wages in the mill = $1849.20 + $690 + $368 + $1242 + $1416.80 + $690 + $1058 + $6752.80 = $14,066.80.

33. The output for 184 days = 184 × 95,000 ft. = 17,480,000 ft.

34. To transport 95,000 ft. of lumber [Ex. 33] cost 95.000 × $1.75 = $166.25.
To transport the season's output cost 184 × $166.25 = $30,590.

35. $\frac{3}{5}$ of 95,000 ft. = 57,000 ft., which sold for 57.000 × $22.25 = $1268.25;
$\frac{1}{10}$ of 95,000 ft. = 9500 ft., which sold for 9.500 × $28.75 = $273.125;
The rest, 28,500 ft., sold for 28.500 × $19.75 = $562.875;
The value of one day's output = $1268.25 + $273.125 + $562.875 = $2104.25.

36. In 184 days the receipts = 184 × $2104.25 = $387,182.

Page 188

37. 12 ft. = 4 yd., 18 ft. = 6 yd., and 720 ft. = 240 yd.; then the quantity of material removed = (4 × 6 × 240) cu. yd. = 5760 cu. yd.

38. The cost for 5760 cu. yd. [Ex. 37, ans.] = 5760 × $3.75 = $21,600.

39. Since 292 ft. of shaft were sunk in 365 days, 720 ft. required $\frac{720}{292}$ of 365 days, or 900 days.

40. At a cost of $.90 + $3.60, or $4.50, per lineal yard 567 ft., or 189 yd., of tunnel cost 189 × $4.50 = $850.50.

41. Each loaded car weighed 850 lb. + 2240 lb. = 3090 lb.;
8 loaded cars weighed 8 × 3090 lb. = 24,720 lb.

42. Since the track had 2 parallel rails there were 2 × 180 yd., or 360 yd., of rails, whose weight was 360 × 35 lb., or 12,600 lb. = (12,600 ÷ 2240) long tons = $5\frac{5}{8}$ long tons; hence, the cost of the rails = $5\frac{5}{8}$ × $13.20 = $74.25.

43. It took as many seconds to reach the surface as 24 ft. is contained times in 720 ft., or 30 sec.

44. They earn together $5\frac{1}{2} \times \$.69$, or $\$3.79\frac{1}{2}$;
The miner's earnings per day $= \frac{2}{3}$ of $\$3.79\frac{1}{2} = \$2.53$.
The laborer's earnings per day $= \frac{1}{3}$ of $\$3.79\frac{1}{2} = \$1.26\frac{1}{2}$.

45. Since the miner earned \$2.53 per day [Ex. 44, ans.], his share of the earnings in November $= 24 \times \$2.53 = \$60.72$.

46. Since [Ex. 45] $24 \times 5\frac{1}{2}$ T., or 132 T., were mined in November, the amount of powder required $= 132 \times 10\frac{2}{3}$ oz., or 1408 oz. $= (1408 \div 16)$ lb., or 88 lb. Since 25 lb. of powder cost \$1.50, 88 lb. cost $\frac{88}{25}$ of \$1.50, or \$5.28.

Page 189

47. Lard oil cost $1\frac{3}{8} \times \$.48$, or \$.66; the total expenses, including the cost of powder [Ex. 46, ans.], $= \$5.28 + \$.18 + \$.96 + \$.15 + \$.66 = \$7.23$.

48. \$60.72 less expenses, \$7.23 [Ex. 47, ans.], = \$53.49, net earnings.

49. The cost for the locomotive per day $= \$4.25 + \$.50 + \$.60 = \$5.35$;
The cost for 24 days $= 24 \times \$5.35 = \$128.40$.

50. The cost of mule power per day $= \$9 + \$7.25 = \$16.25$;
The cost for 24 days $= 24 \times \$16.25 = \$390$.

51. The amount saved [Ex. 49 and 50, ans.] $= \$390 - \$128.40 = \$261.60$.

52. In one day all received $\frac{1}{6}$ of \$219.30, or \$36.55;
Each received per day $\$36.55 \div 43$, or \$.85.

53. Since $\frac{3}{16}$ of the coal was lost, $\frac{13}{16}$ was secured; if $\frac{13}{16}$ was 1365 L.T., the amount mined in one day $=$ 1365 L.T. $\div \frac{13}{16} =$ 1680 L.T.; then the loss $=$ 1680 L.T. $-$ 1365 L.T. $=$ 315 L.T.

54. The expense per ton $= \$2.08 + \$.96 = \$3.04$;
The profit per ton $= \$3.40 - \$3.04 = \$.36$;
The total profits $= 850 \times \$.36 = \$306$.

55. He bought the coal at \$3.40 per long ton [Ex. 54]; the entire cost per ton $= \$3.40 + \$.85 + \$.75 = \$5$; the cost of all the coal $= 850 \times \$5 = \$4250$; 850 L.T. $= 850 \times 2240$ lb., or 1,904,000 lb., $= (1{,}904{,}000 \div 2000)$ short tons, or 952 T., which sold for $952 \times \$6.25 = \$5950$; he therefore gained $\$5950 - \$4250$, or \$1700.

56. The output the next year = 36,940,710 T. + 23,301,750 T. = 60,242,460 T.

Page 190

57. In 24 hr. it picks up $24 \times 85 \times 1\frac{1}{2}$ T. = 3060 T.

58. Since [Ex. 57] the amount of earth dredged per day $= 24 \times 85$ cu. yd. $= 2040$ cu. yd., the value of the gold $= 2040 \times \$.17\frac{1}{2} = \$357$.

59. Since the value of the gold dredged in one day is $357 [Ex. 58, ans.], the value of that dredged in 365 days = 365 × $357 = $130,305.

60. To dredge 12½ A. takes 12½ × 11 days, or 137½ days; since $357 is the value of one day's work, 137½ × $357, or $49,087.50, is the value of the gold from 12½ A.

61. The expense of sinking the shaft = 102 × $16.75 = $1708.50.

62. The total length of the drifts = 184 ft. + 213 ft. + 239 ft. + 180 ft. + 93 ft. + 198 ft. + 41 ft. + 156 ft. = 1304 ft.

63. No. 1 powder cost 1015 × $.16 = $162.40;
No. 2 powder cost 12,760 × $.12 = $1531.20;
The cost of powder = $162.40 + $1531.20 = $1693.60.

64. At $.52 per 1000 ft., 37,500 ft. of fuse cost 37.500 × $.52 = $19.50;
The caps cost 98 × $.60 = $58.80;
The cost of fuse and caps = $19.50 + $58.80 = $78.30.

Page 191

65. The cost per pound = $114 ÷ 1520 = $.075, or 7½¢.

66. The wood cost 167½ × $5 = $837.50;
5800 lb. of coal = (5800 ÷ 2000) T., or 2.9 T., costing 2.9 × $15 = $43,50,
The cost of fuel = $837.50 + $43.50 = $881.

67. The total expenses, including those found in Ex. 63–66, = $1693.60 + $78.30 + $114 + $881 + $9750.75 + $216.46 + $85.86 + $283.86 + $414.25 + $521.23 + $148.21 = $14,187.52.

68. Since the total cost = $14,187.52 [Ex. 67, ans.], the cost per foot of drift = $14,187.52 ÷ 1304 = $10.88.

69. Each day 2 foremen received 2 × $4 = $8; 2 brakemen, 2 × $2.50 = $5; 36 miners, 36 × $2.75 = $99; 2 smiths, 2 × $4 = $8; 2 smith's helpers, 2 × $2 = $4; 8 laborers, 8 × $2.50 = $20; their total wages per day = $8 + $5 + $99 + $8 + $4 + $20 = $144. Then their combined wages during a month = 26 × $144 = $3744.

70. $3744 for labor [Ex. 69, ans.] + $249.15 for implements + $260.25 for materials = $4253.40, the total expense.

71. Since the total expense of mining was $4253.40 [Ex. 70, ans.], the expense per ton = $4253.40 ÷ 1020 = $4.17.

72. The total cost of milling = 1020 × $2.48 = $2529.60.

73. The expense of mining per ton, $4.17 [Ex. 71, ans.], + the expense of milling per ton, $2.48 [Ex. 72], = $6.65, the entire expense per ton.

The expense of mining and milling 1020 T. = 1020 × $6.65 = $6783.

74. 1020 T. of ore yielded 1020 × ⅔ oz., or 680 oz., of gold, which in troy weight = (680 ÷ 12) lb. = 56⅔ lb.

75. 680 oz. of gold [Ex. 74, solution] was worth 680 × $20.67, or $14,055.60.

76. The value of the gold, $14,055.60 [Ex. 75, ans.], exceeded the cost of mining and milling, $6783 [Ex. 73, ans.], by $14,055.60 – $6783, or $7272.60.

77. The saving per horse power = $21 – $7 = $14;
The saving on 1370 horse power = 1370 × $14 = $19,180.

Page 195

12. The number of works of fiction = 22%, or .22, of 8400 = 1848.

13. The hospital received 37½%, or ⅜, of $240,000 = $90,000.

14. The quantity of iron = 70%, or .70, of 2240 lb. = 1568 lb.

15. The amount of red fir = 66%, or .66, of 12,200 ft. = 8052 ft.
The amount of pine = 18%, or .18, of 12,200 ft. = 2196 ft.
The amount of spruce = 5%, or .05, of 12,200 ft. = 610 ft.
The amount of hemlock = 5%, or .05, of 12,200 ft. = 610 ft.
The amount of cedar = 2%, or .02, of 12,200 ft. = 244 ft.
The amount of other kinds = 4%, or .04, of 12,200 ft. = 488 ft.

16. The graph indicates Great Britain's share to be 18½%;
18½%, or .18½, of $21,900,000,000 = $4,051,500,000, Great Britain's share.
The graph indicates Germany's share to be 11½%;
11½%, or .11½, of $21,900,000,000 = $2,518,500,000, Germany's share.
The graph indicates the share of the U.S. to be 11%;
11%, or .11, of $21,900,000,000 = $2,409,000,000, the share of the U.S.
The graph indicates France's share to be 7½%;
7½%, or .07½, of $21,900,000,000 = $1,642,500,000, France's share.
The graph indicates the share of The Netherlands to be 7%;
7%, or .07, of $21,900,000,000 = $1,533,000,000, the share of The Netherlands.
The graph indicates Belgium's share to be 4%;
4%, or .04, of $21,900,000,000 = $876,000,000, Belgium's share.
The graph indicates Russia's share to be 3½%;
3½%, or .03½, of $21,900,000,000 = $766,500,000, Russia's share.

17. The imports amounted to 100% – 57½%, or 42½%.

Since the commerce of the U.S. amounted to $2,409,000,000 [Ex. 16, ans.], the value of the imports = 42½%, or .42½, of $2,409,000,000 = $1,023,825,000.

The value of the exports = $2,409,000,000 – $1,023,825,000 = $1,385,175,000.

Page 196

2. $\$14 \div \$60 = .23\frac{1}{3}$; that is, \$14 is $.23\frac{1}{3}$, or $23\frac{1}{3}\%$, of \$60.

3. $\$60 \div \$75 = .80$; that is, \$60 is .80, or 80%, of \$75.

4. $\$16 \div \$14 = 1.14\frac{2}{7}$; that is, \$16 is $1.14\frac{2}{7}$, or $114\frac{2}{7}\%$, of \$14.

5. $\$14 \div \$16 = \frac{7}{8}$; that is, \$14 is $\frac{7}{8}$, or $87\frac{1}{2}\%$, of \$16.

6. $\$32 \div \$1600 = .02$; that is, \$32 is .02, or 2%, of \$1600.

7. 900 yd. ÷ 150 yd. = 6; that is, 900 yd. is 6 times, or 600% of, 150 yd.

8. 150 yd. ÷ 900 yd. = $\frac{1}{6}$; that is, 150 yd. is $\frac{1}{6}$, or $16\frac{2}{3}\%$, of 900 yd.

9. 2 hr. 40 min. = $2\frac{2}{3}$ hr.; $2\frac{2}{3}$ hr. ÷ 8 hr. = $\frac{1}{3}$; that is, 2 hr. 40 min. is $\frac{1}{3}$, or $33\frac{1}{3}\%$, of 8 hr.

10. $\frac{1}{5} \div 30 = \frac{1}{150} = .00\frac{2}{3}$; that is, $\frac{1}{5}$ is $.00\frac{2}{3}$, or $\frac{2}{3}\%$, of 30.

11. $\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$; that is, $\frac{1}{4}$ is $\frac{1}{2}$, or 50%, of $\frac{1}{2}$.

12. $.625 \div 1 = .625$; that is, .625 is .625, or $62\frac{1}{2}\%$, of 1.

13. $.12\frac{1}{2} \div .75 = \frac{1}{6}$; that is, $.12\frac{1}{2}$ is $\frac{1}{6}$, or $16\frac{2}{3}\%$, of .75.

Page 197

14. $2500 \div 6000 = .41\frac{2}{3}$; that is, 2500 is $.41\frac{2}{3}$, or $41\frac{2}{3}\%$, of 6000;
Hence, $41\frac{2}{3}\%$ is in New York.
$900 \div 6000 = .15$; that is, 900 is .15, or 15%, of 6000;
Hence, 15% is in Illinois.

15. The total yield of cocoa = 1000 × $1\frac{3}{4}$ lb. = 1750 lb.;
910 lb. ÷ 1750 lb. = .52; that is, 910 lb. is .52, or 52%, of 1750 lb.;
Hence, 52% of the cocoa is cocoa butter.

16. 9,000,000 bu. ÷ 20,000,000 bu. = .45; that is, 9,000,000 bu. is .45, or 45%, of 20,000,000 bu. Hence, 45% of the wheat went to Great Britain.

17. $88\frac{1}{2}$ lb. ÷ 150 lb. = .59; that is, $88\frac{1}{2}$ lb. is .59, or 59%, of 150 lb.;
Hence, 59% was graphite, and 100% − 59%, or 41%, was clay.

18. Its loss in weight = 279 carats − 106 carats, or 173 carats;
173 ÷ 279 = .62+; that is, 173 carats is .62, or 62%, of 279 carats;
Hence, the loss in weight was 62%.

19. 575,000 ÷ 1,345,000 = .428−; that is, 575,000 is .428, or 42.8%, of 1,345,000. Hence, the number of volumes in the New York State Library is 42.8% of the number in the Library of Congress.

20. Adding the columns in the table, the population = 1,594,100,000;
105,806,000 ÷ 1,594,100,000 = .066+; that is, 105,806,000 is .066, or 6.6%, of 1,594,100,000. Hence, the population of North America is 6.6% of the population of the world.

38,482,000 ÷ 1,594,100,000 = .024+; that is, 38,482,000 is .024, or 2.4%, of 1,594,100,000. Hence, the population of South America is 2.4% of the population of the world.

396,406,000 ÷ 1,594,100,000 = .249−; that is, 396,406,000 is .249, or 24.9%, of 1,594,100,000. Hence, the population of Europe is 24.9% of the population of the world.

906,674,000 ÷ 1,594,100,000 = .569−; that is, 906,674,000 is .569, or 56.9%, of 1,594,100,000. Hence, the population of Asia is 56.9% of the population of the world.

140,274,000 ÷ 1,594,100,000 = .088−; that is, 140,274,000 is .088, or 8.8%, of 1,594,100,000. Hence, the population of Africa is 8.8% of the population of the world.

6,458,000 ÷ 1,594,100,000 = .004+; that is, 6,458,000 is .004, or .4%, of 1,594,100,000. Hence, the population of Australia, etc., is .4% of the population of the world.

Adding the columns in the table, the area = 52,406,000 sq. mi.;

9,430,000 sq. mi. ÷ 52,406,000 sq. mi. = .1799+, or .180−; that is, 9,430,000 sq. mi. is .180, or 18.0%, of 52,406,000 sq. mi. Hence, the area of North America is 18.0% of the total land area.

6,856,000 sq. mi. ÷ 52,406,000 sq. mi. = .131−; that is, 6,856,000 sq. mi. is .131, or 13.1%, of 52,406,000 sq. mi. Hence, the area of South America is 13.1% of the total land area.

3,842,000 sq. mi. ÷ 52,406,000 sq. mi. = .073+; that is, 3,842,000 sq. mi. is .073, or 7.3%, of 52,406,000 sq. mi. Hence, the area of Europe is 7.3% of the total land area.

17,056,000 sq. mi. ÷ 52,406,000 sq. mi. = .325+; that is, 17,056,000 sq. mi. is .325, or 32.5%, of 52,406,000 sq. mi. Hence, the area of Asia is 32.5% of the total land area.

11,512,000 sq. mi. ÷ 52,406,000 sq. mi. = .2196+, or .220−; that is, 11,512,000 sq. mi. is .220, or 22.0%, of 52,406,000 sq. mi. Hence, the area of Africa is 22.0% of the total land area.

3,456,000 sq. mi. ÷ 52,406,000 sq. mi. = .066−; that is, 3,456,000 sq. mi. is .066, or 6.6%, of 52,406,000 sq. mi. Hence, the area of Australia, etc., is 6.6% of the total land area.

254,000 sq. mi. ÷ 52,406,000 sq. mi. = .005−; that is, 254,000 sq. mi. is .005, or .5%, of 52,406,000 sq. mi. Hence, the area of the South Polar Lands is .5% of the total land area.

21. Great Britain's share of the total commerce was 18½%.

Germany's share was 11½%; since 11½% ÷ 18½% = .622−, the commerce of Germany was .622, or 62.2%, of that of Great Britain.

The share of the U.S. was 11%; since $11\% \div 18\frac{1}{2}\% = .595^-$, the commerce of the U.S. was .595, or 59.5%, of that of Great Britain.

The share of France was $7\frac{1}{2}\%$; since $7\frac{1}{2}\% \div 18\frac{1}{2}\% = .405^+$, the commerce of France was .405, or 40.5%, of that of Great Britain.

The share of The Netherlands was 7%; since $7\% \div 18\frac{1}{2}\% = .378^+$, the commerce of The Netherlands was .378, or 37.8%, of that of Great Britain.

Belgium's share was 4%; since $4\% \div 18\frac{1}{2}\% = .216^+$, the commerce of Belgium was .216, or 21.6%, of that of Great Britain.

The share of Russia and Finland was $3\frac{1}{2}\%$; since $3\frac{1}{2}\% \div 18\frac{1}{2}\% = .189^+$, the commerce of Russia and Finland was .189, or 18.9%, of that of Great Britain.

Of the total commerce the share of the U.S. was 11%.

Great Britain's share was $18\frac{1}{2}\%$; since $18\frac{1}{2}\% \div 11\% = 1.682^-$, the commerce of Great Britain was 1.682, or 168.2%, of that of the U.S.

Germany's share was $11\frac{1}{2}\%$; since $11\frac{1}{2}\% \div 11\% = 1.045^+$, the commerce of Germany was 1.045, or 104.5%, of that of the U.S.

France's share was $7\frac{1}{2}\%$; since $7\frac{1}{2}\% \div 11\% = .682^-$, the commerce of France was .682, or 68.2%, of that of the U.S.

The share of The Netherlands was 7%; since $7\% \div 11\% = .636^+$, the commerce of The Netherlands was .636, or 63.6%, of that of the U.S.

Belgium's share was 4%; since $4\% \div 11\% = .364^-$, the commerce of Belgium was .364, or 36.4%, of that of the U.S.

The share of Russia and Finland was $3\frac{1}{2}\%$; since $3\frac{1}{2}\% \div 11\% = .318^+$, the commerce of Russia and Finland was .318, or 31.8%, of that of the U.S.

Page 199

3. Let $x =$ the number.
Then, $.91\,x = \$2184$,
and $x = \$2184 \div .91 = \$2400$.

4. Let $x =$ the number.
Then, $.02\frac{1}{4}\,x = \$864$,
and $x = \$864 \div .0225 = \$38{,}400$.

5. Let $x =$ the number.
Then, $.62\frac{1}{2}\,x$, or $\frac{5}{8}\,x = 5500$,
and $x = 5500 \div \frac{5}{8} = 8800$.

6. Let $x =$ the number.
Then, $.15\,x = \$63.90$,
and $x = \$63.90 \div .15 = \$426$.

7. Let $x =$ the number.
Then, $.05\,x = \$2.25$,
and $x = \$2.25 \div .05 = \$45$.

8. Let $x =$ the number.
Then, $.33\frac{1}{3}x$, or $\frac{1}{3}x = \$5.73$,
and $x = \$5.73 \div \frac{1}{3} = \$17.19$.

9. Let $x =$ the number.
Then, $.87\frac{1}{2}x$, or $\frac{7}{8}x = 1365$,
and $x = 1365 \div \frac{7}{8} = 1560$.

10. Let $x =$ the number.
Then, $.06\frac{1}{4}x = 5200$,
and $x = 5200 \div .0625 = 83{,}200$.

11. Let $x =$ the number.
Then, $.62\frac{1}{2}x$, or $\frac{5}{8}x = 4525$,
and $x = 4525 \div \frac{5}{8} = 7240$.

12. Let $x =$ the total number of acres.
Then, $.58x = 319$,
and $x = 319 \div .58 = 550$, the total number of acres.

13. Let $x =$ the total number of barrels.
Then, $.72x = 18{,}000{,}000$,
and $x = 18{,}000{,}000 \div .72 = 25{,}000{,}000$, the total number of barrels.

14. Let $x =$ the number of tons produced.
Then, $.84x = 37{,}800$,
and $x = 37{,}800 \div .84 = 45{,}000$, the total number of tons.

15. Let $x =$ the entire number of coaches.
Then, $.485x = 13{,}580$,
and $x = 13{,}580 \div .485 = 28{,}000$, the total number of coaches.

16. Let $x =$ the total number of immigrants.
Then, $.186x = 151{,}590$,
and $x = 151{,}590 \div .186 = 815{,}000$, the total number.

17. Let $x =$ the area of Lake Superior in square miles.
Then, $.32x = 9960 + 24 = 9984$,
and $x = 9984 \div .32 = 31{,}200$, the area in square miles.

18. Let $x =$ the income in dollars.
Then, $.15x = .25$ of $\$1{,}875{,}000 = \$468{,}750$,
and $x = \$468{,}750 \div .15 = \$3{,}125{,}000$, the income.

19. The graph indicates the production of the U.S. to be 32%.
Let $x =$ the production of the world in tons.
Then, $.32x = 352{,}000{,}000$,
and $x = 352{,}000{,}000 \div .32 = 1{,}100{,}000{,}000$, the total number of tons.

The graph indicates the production of Great Britain and Ireland to be 62 % – 32 %, or 30 %, of the total production = 30 %, or .30, of 1,100,000,000 T. = 330,000,000 T.

The graph indicates the production of Germany to be 82 % – 62 %, or 20 %, of the total production = 20 %, or $\frac{1}{5}$, of 1,100,000,000 T. = 220,000,000 T.

Page 200

1. 4800 increased by 16$\frac{2}{3}$ %, or $\frac{1}{6}$, of itself = 4800 + 800 = 5600.

2. 1800 decreased by 37$\frac{1}{2}$ %, or $\frac{3}{8}$, of itself = $\frac{5}{8}$ of 1800 = 1125.

3. \$2.50 less 40 %, or $\frac{2}{5}$, of itself = $\frac{3}{5}$ of \$2.50 = \$1.50, the decreased cost.

4. 13,600 increased by 87$\frac{1}{2}$ %, or $\frac{7}{8}$, of itself = 1$\frac{7}{8}$ of 13,600 = 25,500, the number of farms at the beginning of this century.

5. The increase in number = 17,010,000 – 13,500,000 = 3,510,000; 3,510,000 ÷ 13,500,000 = .26; that is, 3,510,000 is .26, or 26 %, of 13,500,000. Hence, the increase was 26 %.

6. The decrease in tonnage = 450,000 T. – 225,000 T. = 225,000 T.; 225,000 T. ÷ 450,000 T. = $\frac{1}{2}$; that is, 225,000 T. is $\frac{1}{2}$, or 50 %, of 450,000 T. Hence, the decrease was 50 %.

7. 20,904 T. decreased by 12$\frac{1}{2}$ %, or $\frac{1}{8}$, of itself = 20,904 T. – 2613 T. = 18,291 T., the actual weight of the currants.

8. 48 lb. less 33$\frac{1}{3}$ %, or $\frac{1}{3}$, of itself = 48 lb. – 16 lb. = 32 lb., its weight after boiling; 32 lb. less 25 %, or $\frac{1}{4}$, of itself = 32 lb. – 8 lb. = 24 lb., its final weight.

Page 201

9. The decrease in price = \$40 – \$16.60 = \$23.40; \$23.40 ÷ \$40 = .58$\frac{1}{2}$; that is, \$23.40 is .58$\frac{1}{2}$, or 58$\frac{1}{2}$ %, of \$40. Hence, the decrease was 58$\frac{1}{2}$ %.

10. \$4.17 less 55 % of itself = 100 % – 55 %, or 45 %, of \$4.17 = \$1.8765, or \$1.88, the average value in Illinois.

\$4.17 plus 111 % of itself = 100 % + 111 %, or 211 %, of \$4.17 = \$8.7987, or \$8.80, the average value in New York.

Page 202

3. Since 138 is equal to a certain number increased by 15 % of itself, 138 is 115 % of the number, or 1.15 times the number.

Hence, the number = 138 ÷ 1.15 = 120.

4. Since 365 is equal to a certain number increased by 25 % of itself, 365 is 125 %, or $\frac{5}{4}$, of the number; hence, the number = 365 ÷ $\frac{5}{4}$ = 292.

5. Since 2345 is equal to a certain number decreased by $12\frac{1}{2}\%$, or $\frac{1}{8}$, of itself, 2345 is $\frac{7}{8}$ of the number; hence, the number $= 2345 \div \frac{7}{8} = 2680$.

6. Since 1612 is equal to a certain number decreased by 35% of itself, 1612 is 65%, or .65, of the number; hence, the number $= 1612 \div .65 = 2480$.

7. Since 420 is equal to a certain number increased by 50% of itself, 420 is 150%, or $\frac{3}{2}$, of the number.

Hence, the number of oranges in the first crop $= 420 \div \frac{3}{2} = 280$ oranges.

8. Since $1408 is equal to a certain amount decreased by 78% of itself, $1408 is 22%, or .22, of the amount.

Hence, the original value of the grain = $1408 ÷ .22 = $6400.

9. Since 204.6 is equal to a certain number less 7% of itself, 204.6 is 93%, or .93, of the number.

Hence, the normal number of bushels = 204.6 million ÷ .93 = 220 million bushels, or 220,000,000 bushels.

10. Since 1,440,000 T. is equal to a certain quantity less 68% of itself, 1,440,000 T. is 32%, or .32, of that quantity.

Hence, the amount harvested the previous season = 1,440,000 T. ÷ .32 = 4,500,000 T.

11. Since 121,000 is equal to a certain number increased by 120% of itself, 120,000 is 220% of the number, or 2.20 times the number.

Hence, the amount of dirt removed in June = 121,000 cu. yd. ÷ 2.2, or 55,000 cu. yd.

Page 203

1. $\$x = 16\%$, or .16, of $\$375 = \$60$.

2. $\$x = \$2.25 \div 12\frac{1}{2}\% = \$2.25 \div \frac{1}{8} = \$18$.

3. $x\% = .125 \div .75 = .16\frac{2}{3}$, or $16\frac{2}{3}\%$.

4. $x = \frac{3}{4} \div 250\% = \frac{3}{4} \div \frac{5}{2} = \frac{3}{10}$.

5. $x = \frac{1}{4}\%$, or $.00\frac{1}{4}$, of $2364 = 5.91$.

6. $x\% = \frac{1}{16} \div \frac{5}{16} = \frac{1}{5}$, or 20%.

7. $x = 23\frac{1}{2} \div 47\% = 23.5 \div .47 = 50$.

8. $x\% = 4$ qt. ÷ 6 gal. = 4 qt. ÷ 24 qt. = $\frac{1}{6}$, or $16\frac{2}{3}\%$.

9. $x = 113\%$ of, or 1.13 times, $7910 = 8938.3$.

10. Since $10,650 is 100% + 113%, or 213%, of $\$x$, $\$x = \$10{,}650 \div 2.13 = \$5000$.

11. Since 3640 mi. is $100\% + 133\frac{1}{3}\%$, or $\frac{7}{3}$, of x mi., x mi. = 3640 mi. ÷ $\frac{7}{3}$ = 1560 mi.

12. x lb. = 1281 lb. − 4% of 1281 lb. = 1281 lb. − 51.24 lb. = 1229.76 lb.

13. Since $\$1247.92 = 100\% - 24\%$, or 76%, of $\$x$, $\$x = \$1247.92 \div .76 = \$1642$.

14. $x = 100\% - 83\frac{1}{3}\%$, or $16\frac{2}{3}\%$, of $6036 = \frac{1}{6}$ of $6036 = 1006$.

15. Since $\$4800.40 = 100\% - 66\frac{2}{3}\%$, or $\frac{1}{3}$, of $\$x$, $\$x = \$4800.40 \div \frac{1}{3} = \$14{,}401.20$.

16. The load weighed 64%, or .64, of 18,700 lb. = 11,968 lb.

17. Since 1,715,000 mi. was 35%, or .35, of the total length of wires, the entire amount = 1,715,000 mi. ÷ .35 = 4,900,000 mi.

18. 120,000 postal cards weigh 120.000 × 5 lb. = 600 lb.; 414 lb. ÷ 600 lb. = .69; that is, the spruce was .69, or 69%, of the material.

132 lb. ÷ 600 lb. = .22; that is, the poplar was .22, or 22%, of the material.

19. 100% of 125,000,000 lb. less 80% of it = 20%, or $\frac{1}{5}$, of 125,000,000 lb. = 25,000,000 lb., the quantity imported from the U.S. 25 yr. later.

100% of 30,000,000 lb. plus 600% of it = 700% of 30,000,000 lb. = 7 × 30,000,000 lb., or 210,000,000 lb., the quantity imported from Canada 25 yr. later.

20. Since 920,000 T. is equal to a certain quantity less 68% of itself, 920,000 T. = 32%, or .32, of that quantity; hence, the output of steel in this country = 920,000 T. ÷ .32 = 2,875,000 T.

Since 920,000 T. is equal to a certain quantity increased by $2\frac{2}{9}\%$ of itself, 920,000 T. = $102\frac{2}{9}\%$ of, or $1.02\frac{2}{9}$ times, that quantity; hence, the output of steel in England = 920,000 T. ÷ $1.02\frac{2}{9}$ = 900,000 T.

Page 205

1. From the key, *les* represents $\$2.50$, the cost, and *asx* represents $\$3.00$, the selling price; $\$3.00 - \$2.50 = \$.50$, the gain; $\$.50 \div \$2.50 = \frac{1}{5}$, or 20%; hence, the gain is 20% of the cost.

2. From the key, *anx* represents $\$3.44$, the cost, and *aor* represents $\$3.87$, the selling price; $\$3.87 - \$3.44 = \$.43$, the gain; $\$.43 \div \$3.44 = .125$, or $12\frac{1}{2}\%$; hence, the gain is $12\frac{1}{2}\%$ of the cost.

3. From the key, *af* represents 36¢, the cost, and *nl* represents 42¢, the selling price; 42¢ − 36¢ = 6¢, the gain; 6¢ ÷ 36¢ = $\frac{1}{6}$, or $16\frac{2}{3}\%$; hence, the gain is $16\frac{2}{3}\%$ of the cost.

4. From the key, *re* represents 75¢, the cost, and *fs* represents 60¢, the selling price; 75¢ − 60¢ = 15¢, the loss; 15¢ ÷ 75¢ = $\frac{1}{5}$, or 20%; hence, the loss is 20% of the cost.

5. From the key, *pxs* represents $1.10, the cost, and *gx* represents $.99, the selling price; $1.10 − $.99 = $.11, the loss; $.11 ÷ $1.10 = $\frac{1}{10}$, or 10%; hence, the loss is 10% of the cost.

6. From the key, *pls* represents $1.20, the cost, and *pxs* represents $1.10, the selling price; $1.20 − $1.10 = $.10, the loss; $.10 ÷ $1.20 = .08⅓, or 8⅓%; hence, the loss is 8⅓% of the cost.

7. From the key, *le* represents 25¢, the cost, and *as* represents 30¢, the selling price; 30¢ − 25¢ = 5¢, the gain; 5¢ ÷ 25¢ = ⅕, or 20%; hence, the gain is 20% of the cost.

8. From the key, *no* represents 48¢, the cost, and *nl* represents 42¢, the selling price; 48¢ − 42¢ = 6¢, the loss; 6¢ ÷ 48¢ = ⅛, or 12½%; hence, the loss is 12½% of the cost.

9. From the key, *pfle* represents $16.25, the cost, and *pges* represents $19.50, the selling price; $19.50 − $16.25 = $3.25, the gain; $3.25 ÷ $16.25 = .20, or 20%; hence, the gain is 20% of the cost.

10. From the key, *lnfs* represents $24.60, the cost, and *asre* represents $30.75, the selling price; $30.75 − $24.60 = $6.15, the gain; $6.15 ÷ $24.60 = .25, or 25%; hence, the gain is 25% of the cost.

11. The cost, $4, is written $\sqsupset\triangle\vee$; the selling price = $4 + 25%, or ¼, of $4 = $5, written $\square\triangle\vee$; hence, the complete mark is $\frac{\sqsupset\triangle\vee}{\square\triangle\vee}$.

12. The cost, $6.48, is written $\sqsubset\sqsupset\sqcap$; the selling price = $6.48 + 25%, or ¼, of $6.48 = $8.10, written $\sqcap\lrcorner\triangle$; hence, the complete mark is $\frac{\sqsubset\sqsupset\sqcap}{\sqcap\lrcorner\triangle}$.

13. The cost, $24.56, is written $\sqcup\sqsupset\square\sqsubset$; the selling price = $24.56 + 25%, or ¼, of $24.56 = $30.70, written $\llcorner\triangle\urcorner\triangle$; hence, the complete mark is $\frac{\sqcup\sqsupset\square\sqsubset}{\llcorner\triangle\urcorner\triangle}$.

14. The cost, $15.20, is written $\lrcorner\square\sqcup\triangle$; the selling price = $15.20 + 25%, or ¼, of $15.20 = $19, written $\lrcorner\ulcorner\triangle\vee$; hence, the complete mark is $\frac{\lrcorner\square\sqcup\triangle}{\lrcorner\ulcorner\triangle\vee}$.

15. The cost, $.96, is written $\ulcorner\sqsubset$; the selling price = $.96 + 25%, or ¼, of $.96 = $1.20, written $\lrcorner\sqcup\triangle$; hence, the complete mark is $\frac{\ulcorner\sqsubset}{\lrcorner\sqcup\triangle}$.

16. The cost, $1.20, is written $\lrcorner\sqcup\triangle$; the selling price = $1.20 − 12½%, or ⅛, of $1.20 = $1.05, written $\lrcorner\triangle\square$; hence, the complete mark is $\frac{\lrcorner\sqcup\triangle}{\lrcorner\triangle\square}$.

17. The cost, $3.60, is written $\llcorner\sqsubset\triangle$; the selling price = $3.60 − 12½%, or ⅛, of $3.60 = $3.15, written $\llcorner\lrcorner\square$; hence, the complete mark is $\frac{\llcorner\sqsubset\triangle}{\llcorner\lrcorner\square}$.

18. The cost, $48.72, is written ⊐⊓⌉⊔; the selling price = $48.72 − 12½%, or ⅛, of $48.72 = $42.63, written ⊐⊔⊏⌊, hence, the complete mark is $\frac{\sqsupset\sqcap\rceil\sqcup}{\sqsupset\sqcup\sqsubset\lfloor}$.

19. The cost, $10, is written ⌋△∨∨; the selling price = $10 − 12½%, or ⅛, of $10 = $8.75, written ⊓⌉□; hence, the complete mark is $\frac{\rfloor\triangle\vee\vee}{\sqcap\rceil\square}$.

20. The cost, $.88, is written ⊓∨; the selling price = $.88 − 12½%, or ⅛, of $.88 = $.77, written ⌉∨; hence, the complete mark is $\frac{\sqcap\vee}{\rceil\vee}$.

21. The cost, 5¢, is written △□; the selling price = 5¢ + 20%, or ⅕, of 5¢ = 6¢, written △⊏; hence, the complete mark is $\frac{\triangle\square}{\triangle\sqsubset}$.

22. The cost, 12¢, is written ⌋⊔; the selling price = 12¢ + 16⅔%, or ⅙, of 12¢ = 14¢, written ⌋⊐; hence, the complete mark is $\frac{\rfloor\sqcup}{\rfloor\sqsupset}$.

23. The cost, 4¢, is written △⊐; the selling price = 4¢ + 25%, or ¼, of 4¢ = 5¢, written △□; hence, the complete mark is $\frac{\triangle\sqsupset}{\triangle\square}$.

24. The cost, $1.28, is written ⌋⊔⊓; the selling price = $1.28 + 12½%, or ⅛, of $1.28 = $1.44, written ⌋⊐∨; hence, the complete mark is $\frac{\rfloor\sqcup\sqcap}{\rfloor\sqsupset\vee}$.

25. The cost, $2.50, is written ⊔□△; the selling price = $2.50 + 50%, or ½, of $2.50 = $3.75, written ⌊⌉□; hence, the complete mark is $\frac{\sqcup\square\triangle}{\lfloor\rceil\square}$.

26. The cost, $2.75, is written ⊔⌉□; the selling price = $2.75 + 40%, or .40, of $2.75 = $3.85, written ⌊⊓□; hence, the complete mark is $\frac{\sqcup\rceil\square}{\lfloor\sqcap\square}$.

27. 55¢ − 40¢ = 15¢, the gain; 15¢ ÷ 40¢ = ⅜, or 37½%; that is, the gain is 37½% of the cost.

28. At 25¢ per 100 lb., 300 T., or 600,000 lb., of ice sold for 6000.00 × $.25, or $1500; $1500 − $750 = $750, his gain; since $750 ÷ $750 = 1, or 100%, the gain was 100% of the cost.

29. Since 30%, or .30, of the cost was $157.53, the cost = $157.53 ÷ .30 = $525.10.

30. 3000 catalogues sold for 3000 × $.03¼ = $97.50; since $97.50 = the cost + 25% of it = 125%, or $\frac{5}{4}$, of the cost, the catalogues cost the printer $97.50 ÷ $\frac{5}{4}$ = $78.

31. ½ of $30 = $15, the cost per case;
1/100 of $15 = $.15, the cost per basket;
Since the gain = 33⅓%, or ⅓, of 15¢ = 5¢, the selling price = 15¢ + 5¢ = 20¢.

32. The cost per short ton = 2000/2240 of $4.20 = $3.75;
The net selling price per short ton = $5.40 − $.40 = $5;
The gain = $5 − $3.75 = $1.25;
$1.25 ÷ $3.75 = ⅓, or 33⅓%; that is, the gain was 33⅓% of the cost.

Page 206

33. 80% of the market value represents the cost, 120% the selling price, and 120% − 80%, or 40%, the gain; 40% ÷ 80% = ½, or 50%; that is, the gain was 50% of the cost.

34. 90% of the market value represents the cost, 112½% the selling price, and 112½% − 90%, or 22½%, the gain; 22½% ÷ 90% = .25, or 25%; that is, the gain is 25% of the cost.

35. The selling price = $1.80 + 20%, or ⅕, of $1.80 = $2.16. Since $2.16 = the marked price less 10% of itself, $2.16 is 90%, or .90, of the marked price; hence, the marked price = $2.16 ÷ .90 = $2.40.

36. The selling price = $3.60 + 16⅔%, or ⅙, of $3.60 = $4.20. Since $4.20 = the marked price less 20% of itself, $4.20 was 80%, or .80, of the marked price; hence, the marked price = $4.20 ÷ .8 = $5.25.

37. The amount received = 50 × $48 = $2400;
The first $1200 = the cost plus 20% of itself = 120%, or 6/5, of the cost;
Hence, the cost = $1200 ÷ 6/5 = $1000;
The other $1200 = the cost less 20% of itself = 80%, or ⅘, of the cost;
Hence, the cost = $1200 ÷ ⅘ = $1500;
The total cost = $1000 + $1500 = $2500;
Therefore he lost $2500 − $2400 = $100.

Page 207

2.	Amount of sales	= 300 × $4	=		$1200.00
	Commission	= 5% of $1200	=	$60.00	
	Freight, etc.			90.50	150.50
	Net proceeds				$1049.50
3.	Amount of sales	= 1000 × $.73½	=		$735.00
	Commission	= 1000 × $.00⅛	=	$1.25	
	Freight, etc.			25.00	26.25
	Net proceeds				$708.75

4.	Amount of sales	= 100 × \$18.50 =		\$1850.00
	Commission	= 3% of \$1850 =	\$55.50	
	Freight, etc.		56.00	111.50
	Net proceeds			\$1738.50

5.	Amount of sales	= 1500 × \$.20 =		\$300
	Commission	= 5% of \$300 =	\$15	
	Freight, etc.		5	20
	Net proceeds			\$280

6.	Amount of sales	= 225 × \$1.75 =		\$393.75
	Commission	= 40% of \$393.75 =	\$157.50	
	Freight, etc.		10.50	168.00
	Net proceeds			\$225.75

7.	Amount of sales	= 4750 × \$.10$\frac{3}{4}$ =		\$510.63
	Commission	= 2$\frac{1}{2}$% of \$510.63 =	\$12.77	
	Freight, etc.		45.75	58.52
	Net proceeds			\$452.11

8.	Amount of sales	= 1000 × \$1.75 =		\$1750.00
	Commission	= 7% of \$1750 =	\$122.50	
	Freight, etc.		25.00	147.50
	Net proceeds			\$1602.50

9. He collected 75%, or $\frac{3}{4}$, of \$4000 = \$3000;
His commission = 15%, or .15, of \$3000 = \$450;
The creditors received \$3000 − \$450 = \$2550.

10. 20,000 × \$.00$\frac{1}{8}$ = \$25, the brokerage.

11. I must pay $\frac{1}{4}$%, or .00$\frac{1}{4}$, of \$5000 = \$12.50.

12. His commission on one book is 40%, or $\frac{2}{5}$, of \$5 = \$2; he must therefore sell as many books as \$2 is contained times in \$240, or 120 books.

13. \$2$\frac{1}{2}$ ÷ \$62$\frac{1}{2}$ = .04; that is, \$2$\frac{1}{2}$ is .04, or 4%, of \$62$\frac{1}{2}$; hence, the commission was 4%.

Page 208

14. 1840 × \$.15 = \$276, the amount of the sales;
5%, or .05, of \$276 = \$13.80, the commission;
\$276 − \$13.80 = \$262.20, the net proceeds.

15. 91,000 × \$.09 = \$8190, the sum paid;
$\frac{1}{2}$%, or .00$\frac{1}{2}$, of \$8190 = \$40.95, the brokerage.

16. 2%, or .02, of $5500 = $110, the commission, city house;
$5500 − $110 = $5390, the net proceeds, city house;
3%, or .03, of $2800 = $84, the commission, country property;
$2800 − $84 = $2716, the net proceeds, country property;
$5390 + $2716 = $8106, the net proceeds, both sales.

17. For 346 subscriptions he received $346; $86.50 ÷ $346 = .25; that is, his commission was .25, or 25%, of the sum received.

18. $3750 ÷ $50,000 = .075; that is, the commission is .075, or 7½%, of the sales.

19. 2%, or .02, of $75,000 = $1500, his commission for the year;
52 × $25 = $1300, his salary for the year;
$1500 + $1300 = $2800, his income for the year.

20. By the accepted offer his commission = 2%, or .02, of $60,000 = $1200;
$1200 + $1500 = $2700, his income;
He is $2700 − $2500, or $200, better off than by the first offer.
The commission by the third offer = 6%, or .06, of $60,000 = $3600;
He is $3600 − $2700, or $900, worse off than by the third offer.

21. 625 lb. butter cost 625 × $.19 = $118.75;
345 lb. butter cost 345 × $.17½ = $60.37½, or $60.38;
3000 eggs cost 30.00 × $1.50 = $45;
126½ lb. cheese cost 126½ × $.11½ = $14.54¾, or $14.55;
20 bbl. sweet potatoes cost 20 × $1.75 = $35;
Hence, the total cost = $118.75 + $60.38 + $45 + $14.55 + $35 = $273.68;
The commission = 2%, or .02, of $273.68 = $5.4736, or $5.48;
Then the cost, commission, and cartage = $273.68 + $5.48 + $2.50 = $281.66.

22. 8000 bu. of corn cost 8000 × $.22 = $1760; the commission = 2%, or .02, of $1760 = $35.20; the elevator charges = 8000 × $.00½ = $40; then the total cost = $1760 + $35.20 + $806.40 + $30.40 + $80 + $40 = $2752.
The cost per bushel = $2752 ÷ 8000 = $.344, or 34.4¢.

Page 210

2. $2400 − 10% of $2400 = $2400 − $240 = $2160;
$2160 − 20% of $2160 = $2160 − $432 = $1728;
$1728 − 25% of $1728 = $1728 − $432 = $1296, the net price.
$2400 − 20% of $2400 = $2400 − $480 = $1920;
$1920 − 25% of $1920 = $1920 − $480 = $1440;
$1440 − 10% of $1440 = $1440 − $144 = $1296, the net price.
Hence, the results are the same.

3. $500 − 20% of $500 = $500 − $100 = $400;
$400 − 10% of $400 = $400 − $40 = $360, the net amount.
$500 − $360 = $140, the total discount.

4. \$750 – 30% of \$750 = \$750 – \$225 = \$525;
\$525 – 20% of \$525 = \$525 – \$105 = \$420, the net amount.
\$750 – \$420 = \$330, the total discount.

5. \$840 – 20% of \$840 = \$840 – \$168 = \$672;
\$672 – 10% of \$672 = \$672 – \$67.20 = \$604.80;
\$604.80 – 5% of \$604.80 = \$604.80 – \$30.24 = \$574.56, the net amount.
\$840 – \$574.56 = \$265.44, the total discount.

6. \$932 – 25% of \$932 = \$932 – \$233 = \$699;
\$699 – 16% of \$699 = \$699 – \$111.84 = \$587.16;
\$587.16 – 5% of \$587.16 = \$587.16 – \$29.36 (\$29.358) = \$557.80, the net amount.
\$932 – \$557.80 = \$374.20, the total discount.

7. \$372.50 – 40% of \$372.50 = \$372.50 – \$149 = \$223.50;
\$223.50 – 10% of \$223.50 = \$223.50 – \$22.35 = \$201.15;
\$201.15 – 5% of \$201.15 = \$201.15 – \$10.05¾ = \$191.09¼, the net amount.
\$372.50 – \$191.09¼ = \$181.40¾, the total discount.

8. The cost at the list price = 280 × \$.12½ = \$35;
\$35 – 20% of \$35 = \$35 – \$7 = \$28;
\$28 – 5% of \$28 = \$28 – \$1.40 = \$26.60, the net cost.

9. \$375 – 40% of \$375 = \$375 – \$150 = \$225;
\$225 – 4% of \$225 = \$225 – \$9 = \$216, the net amount.

10. The cost at the list price = 360 × \$1.25 = \$450;
The discount for payment in 10 days = 4% of \$450 = \$18;
The discount for payment in 30 days = 3% of \$450 = \$13.50;
He therefore pays \$18 – \$13.50, or \$4.50, less.

11. 35% of \$440 = \$154, the direct discount;
\$440 – 20% of \$440 = \$440 – \$88 = \$352;
15% of \$352 = \$52.80; \$88 + \$52.80 = \$140.80, successive discounts;
\$154 – \$140.80 = \$13.20, the difference.

12. \$600 – 45% of \$600 = \$600 – \$270 = \$330, the net price, direct discount;
\$600 – 25% of \$600 = \$600 – \$150 = \$450;
\$450 – 15% of \$450 = \$450 – \$67.50 = \$382.50;
\$382.50 – 5% of \$382.50 = \$382.50 – \$19.125 = \$363.375, the net price, successive discounts;
Hence, the direct discount gives the lower price by \$363.375 – \$330, or \$33.375.

13. The first discount reduced the price to 100% − 12½%, or 87½%, of the list price; the second discount reduced it to 100% − 4%, or 96%, of this, or to 96% of 87½% of the list price; that is, to 84% of the list price.

Hence, the entire discount was 100% − 84%, or 16%.

14. 40% of the list price represents the gain and 100% − 40%, or 60%, of the list price, the cost; 40% ÷ 60% = ⅔; that is, the gain is ⅔, or 66⅔%, of the cost.

15. The first discount reduces the price to 100% − 15%, or 85%, of the list price; the second discount is 10% of 85% of the list price, or 8½% of the list price; hence, successive discounts of 15% and 10% are the same as a single discount of 15% + 8½%, or 23½%.

Page 213

2. The tax rate = $82,965.12 ÷ $12,346,000 = .00672, or 6.72 mills per dollar.

3. The rate being 6.72 mills per dollar [Ex. 2, ans.], or .00672, his tax = .00672 × $12,500 = $84;

The collector's fee = 1% of $84 = $.84;

Hence, he must pay $84 + $.84, or $84.84.

4. The rate = $27,825 ÷ $15,900,000 = .00175, or 1¾ mills per dollar.

5. Deducting poll tax, the property tax = $206,200 − $9115 = $197,085;
The rate = $197,085 ÷ $23,462,500 = .0084, or 8⅖ mills per dollar.

6. Since the tax rate is 8⅖ mills [Ex. 5, ans.], or .0084, the tax on $40,000 + $25,000, or $65,000 = .0084 of $65,000 = $546; the poll tax is $1 [Ex. 5]; the collector's fee on $546 + $1, or $547 = ½% of $547 = $2.73½, or $2.74.

Hence, the citizen must pay $547 + $2.74 = $549.74.

7. Since ¾% of the total tax is for collection, 100% − ¾%, or 99¼%, of the tax must be the cost of the courthouse, $53,595.

Hence, the county tax = $53,595 ÷ .99¼ = $54,000.

8. $93,100,000 + $36,400,000 = $129,500,000, the taxable property;
80% of $129,500,000 = $103,600,000, the assessed valuation;
.0186 of $103,600,000 = $1,926,960, the amount of tax raised.

9. At $1.413 per $100, the tax in Manhattan on $3,483,793,382 + $549,843,253, or $4,033,636,635 = 40,336,366.35 × $1.413 = $56,995,285.65255, or $56,995,285.65.

At $1.413 per $100, the tax in the Bronx on $247,090,767 + $14,762,041, or $261,852,808 = 2,618,528.08 × $1.413 = $3,699,980.17704, or $3,699,980.18.

At $1.489 per $100, the tax in Brooklyn on $853,742,357 + $100,052,348, or $953,794,705 = 9,537,947.05 × $1.489 = $14,202,003.15745, or $14,202,003.16.

At $1.475 per $100, the tax in Queens on $123,781,723 + $10,176,900, or $133,958,623 = 1,339,586.23 × $1.475 = $1,975,889.68925, or $1,975,889.69.

At $1.496 per $100, the tax in Richmond on $43,124,597 + $6,031,550, or $49,156,147 = 491,561.47 × $1.496 = $735,375.95912, or $735,375.96.

Page 214

10. The tax rate per $100 was reduced $2.14 – $1.90, or $.24;
The tax reduction on $64,500 = 645.00 × $.24 = $154.80.

11. Since the rate was $\frac{154}{1000}$ of a mill per dollar, or .000154, the total state tax = .000154 of $7,738,165,640 = $1,191,677.508560, or $1,191,677.51.

13. Tax on $2000 = $3.48
Tax on 500 = .87
Tax on 4 = .007
Tax on $2504 = $4.357,
or $4.36
Hence, his total tax = $4.36 + $1 = $5.36

14. Tax on $3000 = $5.22
Tax on 500 = .87
Tax on 50 = .087
Tax on 6 = .01
Tax on $3556 = $6.187,
or $6.19

15. Tax on $4000 = $6.96
Tax on 10 = .017
Tax on 2 = .003
Tax on $4012 = $6.980,
or $6.98

16. Tax on $70,000 = $121.80
Tax on 300 = .522
Tax on 40 = .07
Tax on 5 = .009
Tax on $70,345 = $122.401,
or $122.41

17. Tax on $80,000 = $139.20
Tax on 9,000 = 15.66
Tax on 600 = 1.044
Tax on 10 = .017
Tax on 4 = .007
Tax on $89,614 = $155.928,
or $155.93

18. Tax on $600,000 = $1044.00
Tax on 40,000 = 69.60
Tax on 3,000 = 5.22
Tax on 200 = .348
Tax on $643,200 = $1119.168,
or $1119.17

19. Tax on $500,000 = $870.00
Tax on 20,000 = 34.80
Tax on 1,000 = 1.74
Tax on $521,000 = $906.54

20. Tax on $700,000 = $1218
Tax on 50,000 = 87
Tax on $750,000 = $1305

21. Tax on $600,000 = $1044.00
Tax on 40,000 = 69.60
Tax on 1,000 = 1.74
Tax on $641,000 = $1115.34

Page 215

1. 30% of $150 = $45, the ad valorem duty;
450 × $.22 = $99, the specific duty;
$45 + $99 = $144, the whole duty.

2. 40% of $4125 = $1650, the duty.
3. 3000 × $.05 = $150, the duty.
4. 100 × 76.5 lb. = 7650 lb., the total weight;
   7650 × $.07 = $535.50, the duty.
5. 20% of $6430 = $1286, the duty.
6. 15% of $600 = $90, the ad valorem duty;
   100 doz. = 1200; 1200 × $.16 = $192, the specific duty;
   $90 + $192 = $282, the total duty.
7. 50% of $7500 = $3750, the duty.
8. 10,000 × $.25 = $2500, the duty.

Page 216

9. 750 × $.06 = $45, the duty.
10. 60% of $550 = $330, the duty.
11. 400 × $1.50 = $600, the total value;
    35% of $600 = $210, the ad valorem duty;
    400 × 36 lb. = 14,400 lb., the total weight;
    14,400 × $.01 = $144, the specific duty;
    $210 + $144 = $354, the total duty.
12. 25,000 cigars were valued at 25.000 × $62.50 = $1562.50;
    25% of $1562.50 = $390.62½, or $390.63, the ad valorem duty;
    The number of boxes of cigars = 25,000 ÷ 50, or 500 boxes;
    The total weight = 500 × 10½ oz. = 5250 oz. = 328⅛ lb.;
    328⅛ × $4.50 = $1476.56¼, or $1476.57, the specific duty;
    $390.63 + $1476.57 = $1867.20, the total duty.
13. 80 × $6 = $480, the value of the razors;
    20% of $480 = $96, the ad valorem duty;
    80 × $1.75 = $140, the specific duty;
    The total cost = $480 + $96 + $140 + $4 = $720;
    80 doz. = 960; hence, each razor cost $720 ÷ 960 = $.75, or 75¢.
14. 7*s.* 6*d.* = 7.5*s.* = £.375; the cost per dozen;
    600 × £.375 = £225, the total cost;
    £225 = 225 × $4.8665 = $1094.9625;
    50% of $1094.9625 = $547.48125, or $547.49, the duty.
15. £252 10*s.* = £252.5 = 252.5 × $4.8665 = $1228.79125, the value, yarn;
    £149 12*s.* = £149.6 = 149.6 × $4.8665 = $728.0284, the value, hose;
    40% of $1228.79125 = $491.5165, or $491.52, ad valorem duty, yarn;
    15% of $728.0284 = $109.20426, or $109.21, ad valorem duty, hose;

2400 × \$ .38$\frac{1}{2}$ = \$ 924, specific duty, yarn;
384 × \$ .70 = \$ 268.80, specific duty, hose;
The total duty = \$ 491.52 + \$ 109.21 + \$ 924 + \$ 268.80 = \$ 1793.53.
The dutiable value = \$ 1228.79125 + \$ 728.0284 = \$ 1956.81965, or \$ 1956.82.

Page 217

16. 2754 fr. = 2754 × \$ .193 = \$ 531.522;
15 % of \$ 531.522 = \$ 79.7283, or \$ 79.73, the ad valorem duty;
324 × \$ .40 = \$ 129.60, the specific duty;
\$ 79.73 + \$ 129.60 = \$ 209.33, the entire duty.

17. 125,400 fr. = 125,400 × \$ .193 = \$ 24,202.20;
20 % of \$ 24,202.20 = \$ 4840.44, the duty;
The total cost = \$ 24,202.20 + \$ 4840.44 + \$ 84.50 = \$ 29,127.14.

18. The cost in Italy = 500 lire = 500 × \$ .193 = \$ 96.50;
The duty = 2000 × \$ .01$\frac{1}{2}$ = \$ 30;
The entire cost = \$ 96.50 + \$ 30 + \$ 10.60 = \$ 137.10.

19. 12,440 crowns = $\frac{12440}{20}$ × \$ 4.052 = \$ 2520.344;
60 % of \$ 2520.344 = \$ 1512.2064, or \$ 1512.21, the duty.

20. The total cost = 3250 × 7*s.* 2$\frac{1}{4}$*d.* = £ 1167 19*s.* 4$\frac{1}{2}$*d.* = £ 1167.96875; 7. 5. 2, " 7.15
To the nearest cent, £ 1167.96875 = 1167.969 × \$ 4.8665 = \$ 5683.92 +;
The ad valorem duty = 55 % of \$ 5683.92 = \$ 3126.156, or \$ 3126.16;
3250 yd. weigh 3250 lb.; the specific duty = 3250 × \$ .44 = \$ 1430;
The duty complete = \$ 3126.16 + \$ 1430 = \$ 4556.16.

21. Since the duty on 3250 yd. of this material is \$ 4556.16 [Ex. 20, ans.], the duty on 3$\frac{1}{4}$ yd. is the same part of \$ 4556.16 that 3$\frac{1}{4}$ is of 3250; that is, $\frac{3\frac{1}{4}}{3250}$, or $\frac{1}{1000}$; $\frac{1}{1000}$ of \$ 4556.16 = \$ 4.56 −; hence, the tariff adds \$ 4.56 to the cost of a suit.

Page 218

1. 35.00 × \$ .70 = \$ 24.50, the premium.

2. For the tin roof the rate per \$100 would have been 70¢ − 60¢, or 10¢, less;
The difference in the premium on \$ 3500 for 1 yr. = 35.00 × \$ .10 = \$ 3.50;
The difference in the premiums on \$ 3500 for 10 yr. = 10 × \$ 3.50 = \$ 35.

3. 50.00 × \$ .25 = \$ 12.50, the annual premium.

4. The annual premium of 50.00 × \$ .25, or \$ 12.50, will amount to 12 × \$ 12.50, or \$ 150, in 12 yr.

The premium for a 3-year period at twice 25¢, or 50¢, for \$ 100 = 50.00 × \$ .50 = \$ 25; since there are 4 3-year periods in 12 years, the total premium paid in this way = 4 × \$ 25 = \$ 100.

Hence, \$ 150 − \$ 100, or \$ 50, will be saved by insuring in 3-year periods.

5. At 60¢ per $100 a premium of $9.60 pays for as many hundred dollars of insurance as $.60 is contained times in $9.60, or 16.

Hence, $1600 is the face of the policy.

6. Since $19.50 is $\frac{1}{2}$%, or .005, of the face of the policy, the face = $19.50 ÷ .005, or $3900.

7. Since $15.20 is the premium on 38 hundred dollars, the premium on one hundred dollars is $15.20 ÷ 38, or $.40.

$.40 ÷ $100 = .004; that is, the premium is .004, or $\frac{2}{5}$%, of the policy.

8. Since $4500 of the loss was covered by insurance, the owner's loss = $5000 − $4500, or $500; the insurance company's loss = $4500, the sum paid the owner.

9. The total amount of insurance = $5000 + $3000 + $2000 = $10,000, of which $\frac{5000}{10000}$, or $\frac{1}{2}$, was in the Phœnix, $\frac{3000}{10000}$, or .3, in the Firemen's, and $\frac{2000}{10000}$, or .2, in the Protective; hence,

The Phœnix bore $\frac{1}{2}$ of the loss, or $\frac{1}{2}$ of $4000 = $2000.
The Firemen's bore .3 of the loss, or .3 of $4000 = $1200.
The Protective bore .2 of the loss, or .2 of $4000 = $800.

10. The premium at the annual rate = 2% of $15,000 = $300;
The premium for 15 days = 14% of $300 = $42.

Page 219

11. Since the corn is worth 8000 × $.42, or $3360, and is insured for $\frac{7}{8}$ of $3360, or $2940, the premium paid is 29.40 × $.85 = $24.99; since all but $3360 − $2940, or $420, is covered by insurance, the owner's loss = $420 + $24.99 = $444.99.

12. The insurance on his two windows = 2 × $3.50 = $7;
The insurance on his stock = 25.000 × $15 = $375;
His total yearly premium = $7 + $375 = $382.

Page 220

1. Since the premium on an ordinary life policy for $1000 at the age of 25 is $20.70, the premium on $2000 is 2 × $20.70, or $41.40.

2. Since the premium on a 20-payment life policy for $1000 at 25 yr. is $29.40, the premium on $5000 is 5 × $29.40, or $147.

3. Since the premium on a 20-year endowment policy for $1000 at 20 yr. is $48.10, the premium on $2500 is 2.5 × $48.10, or $120.25.

4. Since his expectation of life is 35.85 yr., and since premiums are paid at the *beginning* of each year, he will have paid 36 premiums.

Since the premium on an ordinary life policy for $1000 at the age of 30 is $23.50, the total premium = 36 × $23.50 = $846 ; hence, the net cost of his insurance = $846 − $207.36 = $638.64.

Page 221

5. Since the premium on a 20-payment life policy for $1000 at 25 yr. is $29.40, the premiums on $3000 for 20 yr. = 3 × 20 × $29.40 = $1764.

6. The dividends for 20 yr. = 20 × $7 = $140 ; for 19.49 yr. = 19.49 × $2 = $38.98 ; $140 + $38.98 = $178.98, the total dividends. Since the total premium is $1764 [Ex. 5, ans.], the net cost of his insurance = $1764 − $178.98, or $1585.02.

7. Since the premium on a 20-year term policy for $1000 at 35 yr. is $17.70, the amount of 10 premiums on $4000 = 10 × 4 × $17.70 = $708.

Hence, the net cost of his insurance = $708 − $300 = $408.

8. The amount of 10 premiums for $3000 = 10 × 3 × $68 = $2040 ; the several dividends added together = $96.67; $96.67 + $580 = $676.67 ; therefore he lost $2040 − $676.67 = $1363.33.

9. Since the total cost for $3000 was $1363.33 [Ex. 8, ans.], the cost per thousand = ⅓ of $1363.33 = $454.44+.

10. Since $30 is 6 times $5, the cost per year = 6 × $8.75, or $52.50; for 12 yr., 12 × $52.50, or $630.

11. For 6 weeks he received 6 × $30 = $180 ;
For 8 weeks he received 8 × 2 × $30 = $480 ;
The total indemnity = $180 + $480 = $660.

12. The annual premium on $4000 = 4 × $11.25 = $45 ;
The premium for 9 months = 85% of $45 = $38.25.

13. Since ¾%, or .00¾, of the average monthly pay roll was $172.50, the amount of the monthly pay roll = $172.50 ÷ .00¾ = $23,000.

Page 222

1. 1 A. = 43,560 sq. ft., and 120 A. = 120 × 43,560 sq. ft. = 5,227,200 sq. ft.

Since 5,227,200 is the product of the number of feet in length and the number of feet in width, the length in feet = 5,227,200 ÷ 726, or 7200 ft.

2. Since the field was 726 ft. wide [Ex. 1], the number of rows = 726 ft. ÷ 5½ ft., or 132 rows.

3. 120 × 5¾ T. = 690 T., the quantity of seed cane.

4. There were 120 A. [Ex. 3]; 2340 T. ÷ 120 = 19½ T., the yield per acre.

5. Since each acre produced 19½ T. of cane [Ex. 4, ans.], the cost per ton = $37.05 ÷ 19½ = $1.90.

6. 2340 × 80 lb. = 187,200 lb., the sugar he received;
187,200 × \$.03$\frac{1}{2}$ = \$6552, his receipts.

7. Since the cost per acre was \$37.05 [Ex. 5], the cost for 120 A. [Ex. 1] = 120 × \$37.05 = \$4446; then the receipts, \$6552 [Ex. 6, ans.], less the expenses, \$4446 = \$2106, the whole gain.

\$2106 ÷ 120 = \$17.55, the gain per acre.

8. The amount of juice extracted = 75%, or $\frac{3}{4}$, of 2340 T. = 1755 T.

9. The juice contained 13$\frac{1}{3}$% of 1755 T., or 234 T., of sugar.

10. 210.6 T. ÷ 234 T. = .9, or $\frac{9}{10}$; that is, the quantity of sugar extracted was $\frac{9}{10}$ of the total quantity.

11. 210.6 T. of sugar [Ex. 10] were obtained from 2340 T. of cane [Ex. 8]; 210.6 T. ÷ 2340 T. = .09; that is, the sugar obtained was .09, or 9%, of the raw cane.

Page 223

12. 9% of 2000 lb. = 180 lb., the yield of sugar per ton of cane.
19$\frac{1}{2}$ × 180 lb. = 3510 lb., the yield of sugar from an acre.

13. The mill owner paid 2340 × 80 lb. = 187,200 lb. = 93.6 T.;
He retained 210.6 T. − 93.6 T. = 117 T.
117 T., or 2340 cwt., of sugar was worth 2340 × \$3.50 = \$8190.

14. There were 2340 T. of cane [Ex. 13]; 100% − 75%, or 25%, of 2340 T. = 585 T., the quantity of bagasse.

15. The value of 97$\frac{1}{2}$ T. of coal = 97$\frac{1}{2}$ × \$3.90 = \$380.25, which is also the value of 585 T. of bagasse; \$380.25 ÷ 585 = \$.65, the value of 1 T. of bagasse.

16. 500 × 5 lb. = 2500 lb., the added yield per day;
95 × 2500 lb. = 237,500 lb., the added yield in 95 days.

17. The value of the 5 extra pounds [Ex. 16] = 5 × 3.5¢ = 17.5¢, or 17$\frac{1}{2}$¢.

18. One ton of cane takes 10% of 2000 lb., or 200 lb., of water.

19. As many pounds of coal are needed as 8 lb. is contained times in 200 lb., or 25 lb. of coal.

Since 2000 lb. of coal cost \$4, 25 lb. cost $\frac{25}{2000}$ of \$4 = \$.05.

20. Since the 5 extra pounds are worth 17$\frac{1}{2}$¢ [Ex. 17, ans.] and the expense is 5¢ [Ex. 19, ans.], the gain per ton of cane by adding water = 17$\frac{1}{2}$¢ − 5¢ = 12$\frac{1}{2}$¢.

21. Since the added gain per ton is 12$\frac{1}{2}$¢ [Ex. 20, ans.], the added gain during the season = 500 × 95 × \$.12$\frac{1}{2}$ = \$5937.50.

22. 8% of 18 T. = 1.44 T., the average yield in Louisiana.
12% of 34 T. = 4.08 T., the average yield in Cuba.
12% of 55 T. = 6.6 T., the average yield in Hawaii.

Page 224

23. 24 × 20 lb. = 480 lb., the quantity of seed;
480 × $.15 = $72, the cost of the seed.

24. These expenses per acre = $5.20 + $6.10 + $5.75 = $17.05.
These expenses for 24 A. [Ex. 23] = 24 × $17.05 = $409.20.

25. Since $409.20 was 55 % of the whole cost, the cost of the crop = $409.20 ÷ .55 = $744.

Since there were 24 A. [Ex. 23], the cost per acre = $744 ÷ 24 = $31.

26. The number of wagon loads = 300 T. ÷ $2\frac{1}{2}$ T., or 120 loads.

27. Since the crop weighed 300 T. [Ex. 26], the tare = 8 % of 300 T., or 24 T., and the clean beets weighed 300 T. − 24 T. = 276 T.

28. These beets contained 2 % more than 12 % and therefore brought 2 × 25¢, or 50¢, more per ton; hence, the price was $4.50 per ton, and the farmer received 276 × $4.50, or $1242.

29. Since the receipts were $1242 [Ex. 28, ans.] and the expenses $744 [Ex. 25, ans.], the profit on the crop = $1242 − $744 = $498.

Page 225

30. Each ton of beets contained 14 % of 2000 lb., or 280 lb., of sugar; 224 lb. ÷ 280 lb. = .80; that is, the sugar extracted was 80 % of the whole amount.

31. Since the yield of sugar per ton of beets was 224 lb. [Ex. 30], the whole quantity extracted = 276 × 224 lb., or 61,824 lb., and the sum received = 61,824 × $.04$\frac{5}{8}$ = $2859.36.

32. The total cost was $4 per cwt., or $.04 per pound; since the selling price was 4$\frac{5}{8}$¢ per pound [Ex. 31], the gain per pound = 4$\frac{5}{8}$¢ − 4¢ = $\frac{5}{8}$¢, and the gain on 224 lb. [Ex. 30] = 224 × $.00$\frac{5}{8}$ = $1.40.

33. 45,339 T. ÷ 105 = 431.8 T., the quantity used per day.

34. Its daily capacity = 431.8 T. ÷ .85 = 508 T.

35. Coal cost 9660 × $2.50 = $24,150.

36. Lime rock cost 3220 × $1.90 = $6118.

37. Sulphur cost 21,000 × $.02$\frac{1}{4}$ = $472.50.

38. Filter cloth cost 8350 × $.15 = $1252.50.

39. Sugar bags cost 19,300 × $.09 = $1737.

40. Sugar barrels cost 24,135 × $.26$\frac{1}{3}$ = $6355.55.

41. Since 7 % of the world's production was 283,500 T., the amount produced that year = 283,500 T. ÷ .07 = 4,050,000 T.

42. Cuba produced 24 %, or .24, of 4,050,000 T. = 972,000 T.

43. Since the production of cane sugar was 4,050,000 T. [Ex. 41, ans.], the difference in favor of beet sugar $= 5{,}800{,}000$ T. $- 4{,}050{,}000$ T. $= 1{,}750{,}000$ T.

44. $3\frac{2}{5}\%$, or .034, of 5,800,000 T. [Ex. 43] $= 197{,}200$ T., furnished by the U.S.

45. From Ex. 41, ans., and Ex. 43, the combined production $= 4{,}050{,}000$ T. $+ 5{,}800{,}000$ T. $= 9{,}850{,}000$ T.; 5,614,500 T. $\div$ 9,850,000 T. $= .57$; that is, the quantity from Europe was 57 % of the combined production.

Page 226

46. 54 in. $= 4\frac{1}{2}$ ft., 27 in. $= 2\frac{1}{4}$ ft., 16 in. $= 1\frac{1}{3}$ ft.; hence, the volume of a compressed bale $= (4\frac{1}{2} \times 2\frac{1}{4} \times 1\frac{1}{3})$ cu. ft. $= 13\frac{1}{2}$ cu. ft.; then a compressed bale occupies 45 cu. ft. $- 13\frac{1}{2}$ cu. ft., or $31\frac{1}{2}$ cu. ft., less space than a bale before compression.

47. From Ex. 46, 3 uncompressed bales occupy 3×45 cu. ft., or 135 cu. ft., of space; hence, the number of compressed bales that can be put into the space that would be occupied by 3 uncompressed bales $= 135$ cu. ft. $\div 13\frac{1}{2}$ cu. ft., or 10 compressed bales.

48. 500 lb. $-$ 5 % of 500 lb. $=$ 95 % of 500 lb., or 475 lb., the net weight.

49. 400 lb. $\div$ 500 lb. $= \frac{4}{5}$; that is, the Indian bale is 80 % of the American.
230 lb. $\div$ 500 lb. $= .46$; that is, the Brazilian bale is 46 % of the American.
182 lb. $\div$ 500 lb. $= .36\frac{2}{5}$; that is, the Peruvian bale is $36\frac{2}{5}\%$ of the American.
735 lb. $\div$ 500 lb. $= 1.47$; that is, the Egyptian bale is 147 % of the American.

Page 227

50. 480 lb. $\div$ 1500 lb. $= .32$; that is, the lint is 32 % of the seed cotton; then, 100 % $-$ 32 %, or 68 %, is seed.

51. The amount of lint $= 33\frac{1}{3}\%$ of 12,960 lb. $= 4320$ lb.;
The number of bales $= 4320$ lb. $\div$ 480 lb., or 9 bales.

52. Since 20 A. produce 9 bales [Ex. 51], 1 A. produces $\frac{9}{20}$, or 45 %, of a bale.

53. Since [Ex. 51] $33\frac{1}{3}\%$ of the seed cotton is lint, the amount of lint picked per day $= 33\frac{1}{3}\%$ of 120 lb., or 40 lb.; then, the number of days required to pick 480 lb. of lint $= 480$ lb. $\div$ 40 lb., or 12 days.

54. Since it takes 1 hr. 2 min. 30 sec., or 3750 sec., to gin 500 lb. of lint, it takes 3750 sec. $\div$ 500, or $7\frac{1}{2}$ sec., to gin one pound.

55. 2 lb. of lint are ginned in 15 sec., or 1 lb. in $7\frac{1}{2}$ sec.; hence, to gin a bale of 480 lb. net requires $480 \times 7\frac{1}{2}$ sec., or 3600 sec. $= 1$ hr.

56. The amount of seed cotton raised $= 16 \times 720$ lb. $= 11{,}520$ lb.;
The amount left $= 11{,}520$ lb. $-$ 25 % of 11,520 lb. $= 8640$ lb.

57. Since 11,520 lb., or 115.20 cwt., cost \$51.84, 1 cwt. cost \$51.84 ÷ 115.2 = \$.45, the price of picking per 100 lb.

58. The amount of seed = $66\frac{2}{3}\%$ of 8640 lb. = 5760 lb.
The number of bushels of seed = 5760 lb. ÷ 30 lb., or 192 bu.
The amount of lint = 100% − $66\frac{2}{3}\%$, or $33\frac{1}{3}\%$, of 8640 lb. = 2880 lb.

59. The net weight of a bale = 500 lb. − 20 lb., or 480 lb.;
The number of bales = 2880 lb. ÷ 480 lb., or 6 bales.

60. 5760 lb. of seed = (5760 ÷ 30) bu. = 192 bu ;
192 × \$.12 = \$23.04, the receipts from seed;
6 bales of lint weighed 6 × 500 lb. = 3000 lb.;
3000 × \$.06$\frac{1}{2}$ = \$195, the receipts from lint;
\$23.04 + \$195 = \$218.04, the total receipts.

61. His gain = 100% − 75%, or 25%, of \$218.04 = \$54.51.

Page 228

62. The sum paid for rent = 16 × \$3$\frac{1}{2}$ = \$56 ;
The total expense = \$56 + \$167.53 = \$223.53 ;
The receipts from cotton = 4000 × \$.06$\frac{1}{2}$ = \$260 ;
The receipts from seed = 256 × \$.12 = \$30.72;
The total receipts = \$260 + \$30.72 = \$290.72 ;
He would then have gained \$290.72 − \$223.53 = \$67.19.

63. 425 bales weighed 425 × 5 cwt. = 2125 cwt.;
Hence, the rate per cwt. = \$1062.50 ÷ 2125 = \$.50.

64. The freight rate to New York being 50¢ per cwt. [Ex. 63, ans.], the difference in favor of the rate to Liverpool = 50¢ − 35¢, or 15¢; hence, to ship 2125 cwt. [Ex. 63, solution] to Liverpool would have cost 2125 × \$.15, or \$318.75, less.

65. The car carried 55 × 500 lb. = 27,500 lb.

66. The weight of cotton carried by the car = 160 × 428$\frac{1}{8}$ lb. = 68,500 lb.

67. Egypt contributed $6\frac{2}{3}\%$, or .06$\frac{2}{3}$, of 18,000,000 bales = 1,200,000 bales.
Brazil contributed $1\frac{2}{3}\%$, or .01$\frac{2}{3}$, of 18,000,000 bales = 300,000 bales.
East Indies contributed $16\frac{2}{3}\%$, or $\frac{1}{6}$, of 18,000,000 bales = 3,000,000 bales.
The U.S. contributed 75%, or $\frac{3}{4}$, of 18,000,000 bales = 13,500,000 bales.

68. The whole crop amounted to 18,000,000 bales [Ex. 67]; 3,600,000 ÷ 18,000,000 = .20 ; that is, the quantity used by Great Britain was .20, or 20%, of the whole crop.

5,100,000 ÷ 18,000,000 = .28$\frac{1}{3}$; that is, the quantity used by the continent of Europe was .28$\frac{1}{3}$, or $28\frac{1}{3}\%$, of the whole crop.

4,320,000 ÷ 18,000,000 = .24 ; that is, the quantity used by the U.S. was .24, or 24%, of the whole crop.

Page 229

69. 30 T. ÷ 24 = 1¼ T., the amount used per hour.

70. Since the mill uses 30 T. of seed per day [Ex. 69], the number of days necessary to treat 6300 T. = 6300 ÷ 30, or 210 days.

71. The price of linters per pound = \$1.05 ÷ 30 = \$.035, or 3½¢.

72. Since 950 lb. of hulls is worth \$1.33, the value of 2000 lb. of hulls = $\frac{2000}{950}$ of \$1.33 = \$2.80.

73. The price of oil per gallon = \$8.00 ÷ 40 = \$.20, or 20¢.

74. Since 675 lb., or 6.75 cwt., of meal is worth \$6.75, the price of meal per cwt. = \$6.75 ÷ 6.75 = \$1.

75. From the table the total value = \$1.05 + \$1.33 + \$8.00 + \$6.75 = \$17.13.

76. Since the value is \$17.13 [Ex. 75, ans.], the profit per ton = \$17.13 − \$13.75 = \$3.38.

77. 6300 × \$3.38 = \$21,294, the total profit.

78. 1 ft. 2 in. = 14 in., 1 ft. 6 in. = 18 in., 1 ft. 8 in. = 20 in.; then, the cubic contents of the bale = (14 × 18 × 20) cu. in. = 5040 cu. in.; hence, the number of pounds in the bale = 5040 cu. in. ÷ 50.4 cu. in., or 100 lb.

79. 351¾ T. = 703,500 lb.; the pressure per square inch = 703,500 lb. ÷ 201 = 3500 lb.

Page 231

9.

$$\begin{array}{rl} 3\% \text{ of } \$5000 = & \$150, \text{ int. for 1 yr.} \\ \frac{1}{2} \text{ of int. for 1 yr.} = & \underline{75, \text{ int. for } \phantom{1 \text{ yr. }} 6 \text{ mo.}} \\ & \$225, \text{ int. for 1 yr. 6 mo.} \end{array}$$

10.

$$\begin{array}{rl} 4\% \text{ of } \$5000 = & \$200, \text{ int. for 1 yr.} \\ \frac{1}{2} \text{ of int. for 1 yr.} = & 100, \text{ int. for } \phantom{1 \text{ yr. }} 6 \text{ mo.} \\ \frac{1}{2} \text{ of int. for 6 mo.} = & \underline{50, \text{ int. for } \phantom{1 \text{ yr. }} 3 \text{ mo.}} \\ & \$350, \text{ int. for 1 yr. 9 mo.} \end{array}$$

11. The time from Aug. 1, 1906, to Nov. 1, 1907 = 1 yr. 3 mo.

$$\begin{array}{rl} 4\% \text{ of } \$3225 = & \$129.00, \text{ int. for 1 yr.} \\ \frac{1}{4} \text{ of int. for 1 yr.} = & \underline{32.25, \text{ int. for } \phantom{1 \text{ yr. }} 3 \text{ mo.}} \\ & \$161.25, \text{ int. for 1 yr. 3 mo.} \end{array}$$

12. The time from May 1, 1906, to Nov. 1, 1909 = 3 yr. 6 mo.

3½% of \$4175 = \$146.125, int. for 1 yr.

$$\begin{array}{rl} 3 \times \$146.125 = & \$438.375, \text{ int. for 3 yr.} \\ \frac{1}{2} \text{ of int. for 1 yr.} = & \underline{73.062\tfrac{1}{2}, \text{ int. for } \phantom{3 \text{ yr. }} 6 \text{ mo.}} \\ & \$511.44, \text{ int. for 3 yr. 6 mo.} \end{array}$$

Page 232

14. 6% of \$5000 = \$300, int. for 1 yr.
¼ of int. for 1 yr. = 75, int. for 3 mo.
1/30 of int. for 3 mo. = 2.50, int. for 3 da.
\$377.50, int. for 1 yr. 3 mo. 3 da.
\$5000 + \$377.50 = \$5377.50, the amount.

15. 5% of \$5000 = \$250.00, int. for 1 yr.
½ of int. for 1 yr. = 125.00, int. for 6 mo.
1/30 of int. for 6 mo. = 4.167, int. for 6 da.
\$379.17, int. for 1 yr. 6 mo. 6 da.
\$5000 + \$379.17 = \$5379.17, the amount.

16. 7% of \$2500 = \$175.00, int. for 1 yr.
½ of int. for 1 yr. = 87.50, int. for 6 mo.
⅙ of int. for 6 mo. = 14.583, int. for 1 mo.
½ of int. for 1 mo. = 7.292, int. for 15 da.
\$284.37½, int. for 1 yr. 7 mo. 15 da.
\$2500 + \$284.37½ = \$2784.37½, the amount.

17. 5% of \$3650 = \$182.50, int. for 1 yr.
2 × \$182.50 = \$365.00, int. for 2 yr.
¼ of int. for 1 yr. = 45.625, int. for 3 mo.
⅑ of int. for 3 mo. = 5.069, int. for 10 da.
⅑ of int. for 3 mo. = 5.069, int. for 10 da.
⅒ of int. for 10 da. = .507, int. for 1 da.
\$421.27, int. for 2 yr. 3 mo. 21 da.
\$3650 + \$421.27 = \$4071.27, the amount.

18. 4% of \$7500 = \$300, int. for 1 yr.
3 × \$300 = \$900.00, int. for 3 yr.
⅙ of int. for 1 yr. = 50.00, int. for 2 mo.
¼ of int. for 2 mo. = 12.50, int. for 15 da.
⅕ of int. for 15 da. = 2.50, int. for 3 da.
\$965.00, int. for 3 yr. 2 mo. 18 da.
\$7500 + \$965 = \$8465, the amount.

19. 6% of \$875.25 = \$52.515, int. for 1 yr.
2 × \$52.515 = \$105.03, int. for 2 yr.
⅓ of int. for 1 yr. = 17.505, int. for 4 mo.
¼ of int. for 4 mo. = 4.376+, int. for 1 mo.
½ of int. for 1 mo. = 2.188+, int. for 15 da.
1/30 of int. for 1 mo. = .146−, int. for 1 da.
\$129.25, int. for 2 yr. 5 mo. 16 da.
\$875.25 + \$129.25 = \$1004.50, the amount.

20. $3\frac{1}{2}\%$ of \$169.75 = \$5.941, int. for 1 yr.
3 × \$5.941 = \$17.823, int. for 3 yr.
$\frac{1}{2}$ of int. for 1 yr. = 2.971, int. for 6 mo.
$\frac{1}{2}$ of int. for 6 mo. = 1.485, int. for 3 mo.
$\frac{1}{3}$ of int. for 6 mo. = .99, int. for 2 mo.
$\frac{1}{6}$ of int. for 2 mo. = .165, int. for 10 da.
\$23.43, int. for 3 yr. 11 mo. 10 da.
\$169.75 + \$23.43 = \$193.18, the amount.

21. $4\frac{1}{2}\%$ of \$15,000 = \$675, int. for 1 yr.
Since 360 da. are considered 1 yr., 60 da. = $\frac{60}{360}$, or $\frac{1}{6}$, of a year;
$\frac{1}{6}$ of int. for 1 yr. = \$112.50, int. for 60 da.
\$15,000 + \$112.50 = \$15,112.50, the amount.

22. 2% of \$500,000 = \$10,000, int. for 1 yr.
Since 360 da. are considered 1 yr., 90 da. = $\frac{90}{360}$, or $\frac{1}{4}$, of a year;
$\frac{1}{4}$ of int. for 1 yr. = \$2500, int. for 90 da.
\$500,000 + \$2500 = \$502,500, the amount.

23. 5% of \$3264.18 = \$163.209, int. for 1 yr.
Since 360 da. are considered 1 yr., 60 da. = $\frac{60}{360}$, or $\frac{1}{6}$, of a year;
$\frac{1}{6}$ of int. for 1 yr. = \$27.202, int. for 60 da.
$\frac{1}{20}$ of int. for 60 da. = 1.360, int. for 3 da.
\$28.56, int. for 63 da.
\$3264.18 + \$28.56 = \$3292.74, the amount.

24. 6% of \$4870.21 = \$292.213, int. for 1 yr.
Since 360 da. are considered 1 yr., 120 da. = $\frac{120}{360}$, or $\frac{1}{3}$, of a year;
$\frac{1}{3}$ of int. for 1 yr. = \$97.404, or \$97.40, int. for 120 da.
\$4870.21 + \$97.40 = \$4967.61, the amount.

25. The time from Oct. 11, 1906 to Jan. 26, 1907 = 3 mo. 15 da.
5% of \$3000 = \$150, int. for 1 yr.
$\frac{1}{4}$ of int. for 1 yr. = \$37.50, int. for 3 mo.
$\frac{1}{6}$ of int. for 3 mo. = 6.25, int. for 15 da.
\$43.75, int. for 3 mo. 15 da.
\$3000 + \$43.75 = \$3043.75, the amount.

26. The time from Aug. 16, 1907 to Dec. 28, 1909 = 2 yr. 4 mo. 12 da.
$3\frac{1}{2}\%$ of \$5000 = \$175, int. for 1 yr.
2 × \$175 = \$350, int. for 2 yr.
$\frac{1}{3}$ of int. for 1 yr. = 58.333, int. for 4 mo.
$\frac{1}{10}$ of int. for 4 mo. = 5.833, int. for 12 da.
\$414.17, int. for 2 yr. 4 mo. 12 da.
\$5000 + \$414.17 = \$5414.17, the amount.

27. The time from Nov. 12, 1906 to June 30, 1912 = 5 yr. 7 mo. 18 da.
6% of $466.30 = $27.978, int. for 1 yr.
5 × $27.978 = $139.890, int. for 5 yr.
½ of int. for 1 yr. = 13.989, int. for 6 mo.
⅙ of int. for 6 mo. = 2.332, int. for 1 mo.
½ of int. for 1 mo. = 1.166, int. for 15 da.
⅕ of int. for 15 da. = .233, int. for 3 da.
$157.61, int. for 5 yr. 7 mo. 18 da.
$466.30 + $157.61 = $623.91, the amount.

28. The time from Sept. 27, 1906 to Apr. 16, 1908 = 1 yr. 6 mo. 19 da.
7% of $174.65 = $12.226, int. for 1 yr.
½ of int. for 1 yr. = 6.113, int. for 6 mo.
1/12 of int. for 6 mo. = .509, int. for 15 da.
⅕ of int. for 15 da. = .102, int. for 3 da.
⅓ of int. for 3 da. = .034, int. for 1 da.
$18.98, int. for 1 yr. 6 mo. 19 da.
$174.65 + $18.98 = $193.63, the amount.

29. Time = 5 mo. 28 da.; 2½% of $50,000 = $1250, int. for 1 yr.
⅓ of int. for 1 yr. = $416.667, int. for 4 mo.
¼ of int. for 4 mo. = 104.167, int. for 1 mo.
½ of int. for 1 mo. = 52.083, int. for 15 da.
⅓ of int. for 1 mo. = 34.722, int. for 10 da.
⅕ of int. for 15 da. = 10.417, int. for 3 da.
$618.06, int. for 5 mo. 28 da.
$50,000 + $618.06 = $50,618.06, the amount.

30. Time = 10 mo. 19 da.; 4½% of $125,000 = $5625, int. for 1 yr.
½ of int. for 1 yr. = $2812.50, int. for 6 mo.
⅓ of int. for 1 yr. = 1875.00, int. for 4 mo.
⅛ of int. for 4 mo. = 234.375, int. for 15 da.
⅕ of int. for 15 da. = 46.875, int. for 3 da.
⅓ of int. for 3 da. = 15.625, int. for 1 da.
$4984.37½, int. for 10 mo. 19 da.
$125,000 + $4984.37½ = $129,984.37½, the amount.

31. Time = 3 yr. 1 mo. 19 da.; 5% of $320,000 = $16,000, int. for 1 yr.
3 × $16,000 = $48,000.00, int. for 3 yr.
1/12 of int. for 1 yr. = 1333.333, int. for 1 mo.
½ of int. for 1 mo. = 666.667, int. for 15 da.
⅕ of int. for 15 da. = 133.333, int. for 3 da.
⅓ of int. for 3 da. = 44.444, int. for 1 da.
$50,177.78, int. for 3 yr. 1 mo. 19 da.
$320,000 + $50,177.78 = $370,177.78, the amount.

Page 233

1. 2)$4.50, 60 da.
$2.25, 30 da.

2. 2)$7.50, 60 da.
+ 3.75, 30 da.
$11.25, 90 da.

3. $5.00, 60 da.

4. 20)$8.25, 60 da.
+ .41, 3 da.
$8.66, 63 da.

5. 4)$12.00, 60 da.
− 3.00, 15 da.
$9.00, 45 da.

6. $50.00, 60 da.

7. $375.00, 60 da.
+ 375.00, 60 da.
$750.00, 120 da.

8. $750.00, 60 da.
12) + 750.00, 60 da.
+ 62.50, 5 da.
$1562.50, 125 da.

Page 234

1. By the table the time from Mar. 6 to May 5 = 61 da. − 1 da. = 60 da.
$50.00, 60 da.

2. By the table the time from Apr. 10 to July 9 = 91 da. − 1 da. = 90 da.
2)$27.50, 60 da.
+ 13.75, 30 da.
$41.25, 90 da.

3. By the table the time from June 2 to July 5 = 30 da. + 3 da. = 33 da.
2)$30.00, 60 da.
10)$15.00, 30 da.
+ 1.50, 3 da.
$16.50, 33 da.

4. By the table the time from July 5 to Nov. 2 = 123 da. − 3 da. = 120 da.
$50.00, 60 da.
+ 50.00, 60 da.
$100.00, 120 da.

5. By the table the time from Aug. 8 to Oct. 7 = 61 da. − 1 da. = 60 da.
$45.00, 60 da.

6. By the table the time from Sept. 1 to Dec. 3 = 91 da. + 2 da. = 93 da.
2)$72.25, 60 da.
10) + 36.125, 30 da.
+ 3.613, 3 da.
$111.99, 93 da.

7. By the table the time from Nov. 30 to Feb. 1 = 61 da. + 2 da. = 63 da.
20)$84.00, 60 da.
+ 4.20, 3 da.
$88.20, 63 da.

8. By the table the time from July 25 to Nov. 22 = 123 da. − 3 da. = 120 da.
$16.00, 60 da.
+ 16.00, 60 da.
$32.00, 120 da.

9. By the table the time from June 30 to Aug. 2 = 30 da. + 3 da. = 33 da.
2)$.225, 60 da.
10)$.112½, 30 da.
+ .011, 3 da.
$.12, 33 da.

10. By the table the time from Sept. 26 to Nov. 15 = 61 da. − 11 da. = 50 da.
6)$.3575, 60 da.
− .0596, 10 da.
$.30, 50 da.

11. The time from Aug. 21 to Sept. 4 = 10 da. + 4 da. = 14 da.
4)$150.00, 60 da.
15)$37.50, 15 da.
− 2.50, 1 da.
$35.00, 14 da.

12. The time from Dec. 22 to Jan. 7 = 9 da. + 7 da. = 16 da.

4)$500.00, 60 da.
15)$125.00, 15 da.
+ 8.33, 1 da.
$133.33, 16 da.

13. By the table the time from May 4 to July 1 = 61 da. – 3 da. = 58 da.

30)$1250.00, 60 da.
– 41.667, 2 da.
$1208.33, 58 da.

14. By the table the time from Nov. 6 to Feb. 2 = 92 da. – 4 da. = 88 da.

3)$5000.00, 60 da.
5) + 1666.667, 20 da.
+ 333.333, 4 da.
+ 333.333, 4 da.
$7333.33, 88 da.

Page 235

2. Int. on $1 for 7 yr. = $.42
Int. on $1 for 4 mo. = .02
Int. on $1 for 20 da. = .003⅓
Int. on $1 for 7 yr. 4 mo. 20 da. = $.443⅓
The interest on $42.50 = 42.50 × $.443⅓, or $18.84.

3. Int. on $1 for 5 yr. = $.30
Int. on $1 for 3 mo. = .015
Int. on $1 for 15 da. = .002½
Int. on $1 for 5 yr. 3 mo. 15 da. = $.317½
The interest on $39.75 = 39.75 × $.317½, or $12.62.

4. Int. on $1 for 6 yr. = $.36
Int. on $1 for 5 mo. = .025
Int. on $1 for 10 da. = .001⅔
Int. on $1 for 6 yr. 5 mo. 10 da. = $.386⅔
The interest on $425.10 = 425.10 × $.386⅔, or $164.37.

5. Int. on $1 for 8 yr. = $.48
Int. on $1 for 10 mo. = .05
Int. on $1 for 24 da. = .004
Int. on $1 for 8 yr. 10 mo. 24 da. = $.534
The interest on $365.42 = 365.42 × $.534, or $195.13.

6. Int. on $1 for 4 yr. = $.24
Int. on $1 for 11 mo. = .055
Int. on $1 for 18 da. = .003
Int. on $1 for 4 yr. 11 mo. 18 da. = $.298
The interest on $875.50 = 875.50 × $.298, or $260.90.

7. Int. on \$1 for 4 yr. = \$.24
Int. on \$1 for 10 mo. = .05
Int. on \$1 for 17 da. = $.002\frac{5}{6}$
Int. on \$1 for 4 yr. 10 mo. 17 da. = $\$.292\frac{5}{6}$
The interest on \$920.65 = 920.65 × $\$.292\frac{5}{6}$, or \$269.60.

8. By subtracting dates the time = 1 yr. 0 mo. 19 da.
Int. on \$1 for 1 yr. = \$.06
Int. on \$1 for 19 da. = $.003\frac{1}{6}$
Int. on \$1 for 1 yr. 19 da. = $\$.063\frac{1}{6}$
The interest on \$1500 = 1500 × $\$.063\frac{1}{6}$, or \$94.75.

9. By subtracting dates the time = 1 yr. 5 mo. 21 da.
Int. on \$1 for 1 yr. = \$.06
Int. on \$1 for 5 mo. = .025
Int. on \$1 for 21 da. = $.003\frac{1}{2}$
Int. on \$1 for 1 yr. 5 mo. 21 da. = $\$.088\frac{1}{2}$
The interest on \$4800 = 4800 × $\$.088\frac{1}{2}$, or \$424.80.

10. By subtracting dates the time = 8 yr. 2 mo. 6 da.
Int. on \$1 for 8 yr. = \$.48
Int. on \$1 for 2 mo. = .01
Int. on \$1 for 6 da. = .001
Int. on \$1 for 8 yr. 2 mo. 6 da. = \$.491
The interest on \$3200 = 3200 × \$.491, or \$1571.20.

11. By subtracting dates the time = 5 yr. 8 mo. 3 da.
Int. on \$1 for 5 yr. = \$.30
Int. on \$1 for 8 mo. = .04
Int. on \$1 for 3 da. = $.000\frac{1}{2}$
Int. on \$1 for 5 yr. 8 mo. 3 da. = $\$.340\frac{1}{2}$
The interest on \$64.45 = 64.45 × $\$.340\frac{1}{2}$, or \$21.95.

12. By subtracting dates the time = 3 yr. 5 mo. 26 da.
Int. on \$1 for 3 yr. = \$.18
Int. on \$1 for 5 mo. = .025
Int. on \$1 for 26 da. = $.004\frac{1}{3}$
Int. on \$1 for 3 yr. 5 mo. 26 da. = $\$.209\frac{1}{3}$
The interest on \$75,000 = 75,000 × $\$.209\frac{1}{3}$, or \$15,700.

13. By subtracting dates the time = 2 yr. 9 mo. 23 da.
Int. on \$1 for 2 yr. = \$.12
Int. on \$1 for 9 mo. = .045
Int. on \$1 for 23 da. = $.003\frac{5}{6}$
Int. on \$1 for 2 yr. 9 mo. 23 da. = $\$.168\frac{5}{6}$
The interest on \$56,000 = 56,000 × $\$.168\frac{5}{6}$, or \$9454.67.

14. By subtracting dates the time = 4 yr. 9 mo. 24 da.
Int. on \$1 for 4 yr. = \$.24
Int. on \$1 for 9 mo. = .045
Int. on \$1 for 24 da. = .004
Int. on \$1 for 4 yr. 9 mo. 24 da. = \$.289
The interest on \$375.60 = 375.60 × \$.289, or \$108.55.

15. By subtracting dates the time = 7 yr. 11 mo. 10 da.
Int. on \$1 for 7 yr. = \$.42
Int. on \$1 for 11 mo. = .055
Int. on \$1 for 10 da. = .001⅔
Int. on \$1 for 7 yr. 11 mo. 10 da. = \$.476⅔
The interest on \$840.07 = 840.07 × \$.476⅔, or \$400.43.

16. By subtracting dates the time = 1 yr. 4 mo. 7 da.
Int. on \$1 for 1 yr. = \$.06
Int. on \$1 for 4 mo. = .02
Int. on \$1 for 7 da. = .001⅙
Int. on \$1 for 1 yr. 4 mo. 7 da. = \$.081⅙
The interest on \$225,000 = 225,000 × \$.081⅙, or \$18,262.50.

17. By subtracting dates the time = 5 mo. 30 da. = 6 mo.
Int. on \$1 for 6 mo. = \$.03
The interest on \$500,000 = 500,000 × \$.03, or \$15,000.

Page 236

1. 6)\$2.50, int. for 60 da. at 6%
+ .417
\$2.92, int. for 60 da. at 7%
\$250 + \$2.92 = \$252.92, the amount.

2. 2)\$5.00, int. for 60 da. at 6%
6)\$2.50, int. for 30 da. at 6%
− .417
\$2.08, int. for 30 da. at 5%
\$500 + \$2.08 = \$502.08, the amount.

3. 2)\$4.00, int. for 60 da. at 6%
+ 2.00, int. for 30 da. at 6%
3)\$6.00, int. for 90 da. at 6%
+ 2.00
\$8.00, int. for 90 da. at 8%
\$400 + \$8 = \$408, the amount.

4. 3)\$5.00, int. for 60 da. at 6%
− 1.667
\$3.33, int. for 60 da. at 4%
\$500 + \$3.33 = \$503.33, the amount.

5. 20)\$1.60, int. for 60 da. at 6%
+ .08, int. for 3 da. at 6%
2)\$1.68, int. for 63 da. at 6%
\$.84, int. for 63 da. at 3%
\$160 + \$.84 = \$160.84, the amount.

6. 2)\$7.75, int. for 60 da. at 6%
10)\$3.875, int. for 30 da. at 6%
+ .387½, int. for 3 da. at 6%
3)\$4.262½, int. for 33 da. at 6%
− 1.421
\$2.84, int. for 33 da. at 4%
\$775 + \$2.84 = \$777.84, the amount.

7. 5)$8.40, int. for 60 da. at 6%
4)$1.68, int. for 12 da. at 6%
+ .42
$2.10, int. for 12 da. at 7½%
$840 + $2.10 = $842.10, the amount.

8. 4)$4.50, int. for 60 da. at 6%
4)$1.125, int. for 15 da. at 6%
– .281
$.84, int. for 15 da. at 4½%
$450 + $.84 = $450.84, the amount.

9. 6)$7.50, int. for 60 da. at 6%
3)$1.25, int. for 10 da. at 6%
– .417
$.83, int. for 10 da. at 4%
$750 + $.83 = $750.83, the amount.

10. 4)$8.00, int. for 60 da. at 6%
– 2.00, int. for 15 da. at 6%
2)$6.00, int. for 45 da. at 6%
$3.00, int. for 45 da. at 3%
$800 + $3 = $803, the amount.

11. 2)$9.00, int. for 60 da. at 6%
6)$4.50, int. for 30 da. at 6%
– .75, int. for 5 da. at 6%
6)$3.75, int. for 25 da. at 6%
– .62½
$3.12½, int. for 25 da. at 5%
$900 + $3.12½ = $903.12½, the amount.

12. $5.00, int. for 60 da. at 6%
5.00, int. for 60 da. at 6%
4)$10.00, int. for 120 da. at 6%
– 2.50
$7.50, int. for 120 da. at 4½%
$500 + $7.50 = $507.50, the amount.

13. Int. on $1 for 3 yr. at 6% = $.18
Int. on $1 for 5 mo. at 6% = .025
Int. on $1 for 10 da. at 6% = .001⅔
Int. on $1 for 3 yr. 5 mo. 10 da. at 6% = $.206⅔
The interest on $5000 at 6% = 5000 × $.206⅔ = $1033.333;
The interest on $5000 at 5% = $1033.333 – ⅙ of $1033.333 = $861.11.
$5000 + $861.11 = $5861.11, the amount.

14. Int. on $1 for 2 yr. at 6% = $.12
Int. on $1 for 7 mo. at 6% = .035
Int. on $1 for 24 da. at 6% = .004
Int. on $1 for 2 yr. 7 mo. 24 da. at 6% = $.159
The interest on $4000 at 6% = 4000 × $.159 = $636;
The interest on $4000 at 8% = $636 + ⅓ of $636 = $848.
$4000 + $848 = $4848, the amount.

15. Int. on $1 for 4 yr. at 6% = $.24
Int. on $1 for 9 mo. at 6% = .045
Int. on $1 for 11 da. at 6% = .001⅚
Int. on $1 for 4 yr. 9 mo. 11 da. at 6% = $.286⅚
The interest on $5000 at 6% = 5000 × $.286⅚ = $1434.167;
The interest on $5000 at 3% = ½ of $1434.167 = $717.08.
$5000 + $717.08 = $5717.08, the amount.

16. Int. on $1 for 2 yr. at 6% = $.12
Int. on $1 for 1 mo. at 6% = .005
Int. on $1 for 22 da. at 6% = $.003\frac{2}{3}$
Int. on $1 for 2 yr. 1 mo. 22 da. at 6% = $\$.128\frac{2}{3}$
The interest on $1400 at 6% = $1400 \times \$.128\frac{2}{3}$ = $180.133;
The interest on $1400 at $4\frac{1}{2}$% = $180.133 − $\frac{1}{4}$ of $180.133 = $135.10.
$1400 + $135.10 = $1535.10, the amount.

17. Int. on $1 for 4 mo. at 6% = $ .02
Int. on $1 for 2 da. at 6% = $.000\frac{1}{3}$
Int. on $1 for 4 mo. 2 da. at 6% = $\$.020\frac{1}{3}$
The interest on $5000 at 6% = $5000 \times \$.020\frac{1}{3}$ = $101.667;
The interest on $5000 at 3% = $\frac{1}{2}$ of $101.667 = $50.83.
$5000 + $50.83 = $5050.83, the amount at 3%.
The interest on $5000 at $3\frac{1}{2}$% = $50.833 + $\frac{1}{6}$ of $50.833 = $59.31.
$5000 + $59.31 = $5059.31, the amount at $3\frac{1}{2}$%.

18. Int. on $1 for 2 mo. at 6% = $.01
Int. on $1 for 5 da. at 6% = $.000\frac{5}{6}$
Int. on $1 for 2 mo. 5 da. at 6% = $\$.010\frac{5}{6}$
The interest on $7500 at 6% = $7500 \times \$.010\frac{5}{6}$ = $81.25;
The interest on $7500 at 5% = $81.25 − $\frac{1}{6}$ of $81.25 = $67.71.
$7500 + $67.71 = $7567.71, the amount at 5%.
The interest on $7500 at $5\frac{1}{2}$% = $67.71 + $\frac{1}{10}$ of $67.71 = $74.48.
$7500 + $74.48 = $7574.48, the amount at $5\frac{1}{2}$%.

19. By subtracting dates the time = 1 yr. 2 mo. 27 da.
Int. on $1 for 1 yr. at 6% = $.06
Int. on $1 for 2 mo. at 6% = .01
Int. on $1 for 27 da. at 6% = $.004\frac{1}{2}$
Int. on $1 for 1 yr. 2 mo. 27 da. at 6% = $\$.074\frac{1}{2}$
The interest on $2440 at 6% = $2440 \times \$.074\frac{1}{2}$ = $181.78;
The interest on $2440 at 4% = $181.78 − $\frac{1}{3}$ of $181.78 = $121.19.
$2440 + $121.19 = $2561.19, the amount.

20. By subtracting dates the time = 1 yr. 4 mo. 22 da.
Int. on $1 for 1 yr. at 6% = $.06
Int. on $1 for 4 mo. at 6% = .02
Int. on $1 for 22 da. at 6% = $.003\frac{2}{3}$
Int. on $1 for 1 yr. 4 mo. 22 da. at 6% = $\$.083\frac{2}{3}$
The interest on $3685 at 6% = $3685 \times \$.083\frac{2}{3}$ = $308.312;
The interest on $3685 at 5% = $308.312 − $\frac{1}{6}$ of $308.312 = $256.93.
$3685 + $256.93 = $3941.93, the amount.

21. By subtracting dates the time = 5 mo. 18 da.
Int. on $1 for 5 mo. at 6% = $.025
Int. on $1 for 18 da. at 6% = .003
Int. on $1 for 5 mo. 18 da. at 6% = $.028
The interest on $75.50 at 6% = 75.50 × $.028 = $2.114;
The interest on $75.50 at 7% = $2.114 + ⅙ of $2.114 = $2.47.
$75.50 + $2.47 = $77.97, the amount.

22. By subtracting dates the time = 5 yr. 6 mo. 25 da.
Int. on $1 for 5 yr. at 6% = $.30
Int. on $1 for 6 mo. at 6% = .03
Int. on $1 for 25 da. at 6% = .004⅙
Int. on $1 for 5 yr. 6 mo. 25 da. at 6% = $.334⅙
The interest on $825.25 at 6% = 825.25 × $.334⅙ = $275.77;
The interest on $825.25 at 7½% = $275.77 + ¼ of $275.77 = $344.71.
$825.25 + $344.71 = $1169.96, the amount.

23. By subtracting dates the time = 1 yr. 2 mo. 28 da.
Int. on $1 for 1 yr. at 6% = $.06
Int. on $1 for 2 mo. at 6% = .01
Int. on $1 for 28 da. at 6% = .004⅔
Int. on $1 for 1 yr. 2 mo. 28 da. at 6% = $.074⅔
The interest on $25,000 at 6% = 25,000 × $.074⅔ = $1866.667;
The interest on $25,000 at 3% = ½ of $1866.667 = $933.33.
$25,000 + $933.33 = $25,933.33, the amount.

Page 237

2. $\$3.000 \times \frac{\overset{2}{\cancel{12}}}{\cancel{6}} = \$6.$

3. $\$5.000 \times \frac{8}{\underset{3}{\cancel{6}}} \times \frac{\cancel{2}}{3} = \$4.44.$

4. $\overset{\$\;.625}{\$\cancel{7}.\cancel{500}} \times \frac{15}{\cancel{6}} \times \frac{1}{\cancel{2}} = \$9.37\tfrac{1}{2}.$

5. $\overset{\$1.455}{\$\cancel{4}.\cancel{365}} \times \frac{\overset{\overset{5}{\cancel{10}}}{\cancel{60}}}{\cancel{6}} \times \frac{5}{\underset{\cancel{3}}{\cancel{6}}} = \$36.37\tfrac{1}{2}.$

6. $\$8.000 \times \frac{10}{\underset{3}{\cancel{6}}} \times \frac{\cancel{2}}{3} = \$8.89.$

7. $\overset{\$1.20}{\$\cancel{7}.\cancel{200}} \times \frac{\overset{30}{\cancel{90}}}{\cancel{6}} \times \frac{2}{\cancel{3}} = \$72.$

8. $\$3.420 \times \frac{\overset{7}{\cancel{42}}}{\cancel{6}} = \$23.94.$

9. $\overset{\$3.125}{\$\cancel{6}.\cancel{250}} \times \frac{\overset{\overset{3}{\cancel{6}}}{\cancel{36}}}{\cancel{6}} \times \frac{3}{\underset{\cancel{2}}{\cancel{4}}} = \$28.12\tfrac{1}{2}.$

$\$\ \ .10$
$\$\cancel{1}.\cancel{2}\cancel{0}$
10. $\$\cancel{7}.\cancel{2}\cancel{0}\cancel{0} \times \frac{93}{\cancel{6}} \times \frac{7}{\cancel{12}} = \$65.10.$

11. From July 6 to Oct. 4 = 90 da.

$\$\ \ .40$
$\$\cancel{2}.\cancel{4}\cancel{0}\cancel{0} \times \frac{\overset{15}{\cancel{90}}}{\cancel{6}} \times \frac{5}{\cancel{6}} = \$30.$

12. From June 4 to Aug. 3 = 60 da.

$\$2.10$
$\$\cancel{6}.\cancel{3}\cancel{0}\cancel{0} \times \frac{\overset{10}{\cancel{60}}}{\cancel{6}} \times \frac{2}{\cancel{3}} = \$42.$

13. From Nov. 10 to Feb. 10 = 92 da.

$\$1.30$
$\$\cancel{7}.\cancel{8}\cancel{0}\cancel{0} \times \frac{\overset{46}{\cancel{92}}}{\cancel{6}} \times \frac{1}{\cancel{2}} = \$59.80.$

14. From Dec. 12 to Feb. 1 = 51 da.

$\$1.35$
$\$\cancel{8}.\cancel{1}\cancel{0}\cancel{0} \times \frac{51}{\cancel{6}} = \$68.85.$

15. From May 16 to Aug. 14 = 90 da.

$\$1.60$
$\$\cancel{9}.\cancel{6}\cancel{0}\cancel{0} \times \frac{\overset{15}{\cancel{90}}}{\cancel{6}} \times \frac{5}{\cancel{6}} = \$120.$

16. From Mar. 1 to June 2 = 93 da.

$\$\ \ .225$
$\$\ \ .\cancel{4}\cancel{5}$
$\$\cancel{2}.\cancel{7}\cancel{0}\cancel{0} \times \frac{\overset{31}{\cancel{93}}}{\underset{\cancel{2}}{\cancel{6}}} \times \frac{7}{\cancel{6}} = \$48.82\tfrac{1}{2}.$

17. From Apr. 1 to June 30 = 90 da.

$\$.0189$
$\$.\cancel{0}\cancel{7}\cancel{5}\cancel{6} \times \frac{\overset{15}{\cancel{90}}}{\cancel{6}} \times \frac{5}{\cancel{4}} = \$1.42.$

18. From Nov. 4 to Jan. 3 = 60 da.

$\$.0108$
$\$.\cancel{0}\cancel{4}\cancel{3}\cancel{2} \times \frac{\overset{10}{\cancel{60}}}{\cancel{6}} \times \frac{3}{\cancel{4}} = \$.32.$

19. From Aug. 7 to Dec. 11 = 126 da.

$\$.04275$
$\$.\cancel{0}\cancel{8}\cancel{5}\cancel{5} \times \frac{\overset{7}{\overset{\cancel{21}}{\cancel{126}}}}{\cancel{6}} \times \frac{5}{\underset{\cancel{2}}{\cancel{6}}} = \$1.50.$

Page 239

2.

$$\begin{array}{l} \text{Int. on } \$2000 \text{ for 12 da. at } 6\% = \$4 \\ \text{Int. on } \underline{\ \ \ 500} \text{ for 12 da. at } 6\% = \underline{\ \ 1} \\ \text{Int. on } \$2500 \text{ for 12 da. at } 6\% = \$5 \end{array}$$

3.

$$\begin{array}{l} \text{Int. on } \$3000 \text{ for 14 da. at } 6\% = \$7.00 \\ \text{Int. on } \underline{\ \ \ 200} \text{ for 14 da. at } 6\% = \underline{\ \ \ \ .467} \\ \text{Int. on } \$3200 \text{ for 14 da. at } 6\% = \$7.47 \end{array}$$

4.

$$\begin{array}{l} \text{Int. on } \$4000 \text{ for 11 da. at } 6\% = \$7.333 \\ \text{Int. on } \underline{\ \ \ 500} \text{ for 11 da. at } 6\% = \underline{\ \ \ \ .917} \\ \text{Int. on } \$4500 \text{ for 11 da. at } 6\% = \$8.25 \end{array}$$

5. Int. on \$5000 for 6 da. at 6% = \$5.

6.

$$\begin{array}{llll} & & \text{20 da.} & \text{9 da.} \\ \text{Int. on } \$4000 \text{ at } 6\% & = & \$13.333 & + \$6.00 \\ \text{Int. on } \underline{\ \ \ 800} \text{ at } 6\% & = & \underline{\ \ 2.667} & + \underline{\ \ 1.20} \\ \text{Int. on } \$4800 \text{ at } 6\% & = & \$16.000 & + \$7.20 = \$23.20. \end{array}$$

7. 20 da. 5 da.
Int. on $8000 at 6% = $26.667 + $6.667
Int. on 700 at 6% = 2.333 + .583
Int. on $8700 at 6% = $29.000 + $7.250 = $36.25

8. Int. on $7000 for 5 mo. at 6% = $175.00
Int. on 400 for 5 mo. at 6% = 10.00
Int. on 30 for 5 mo. at 6% = .75
Int. on 5 for 5 mo. at 6% = .125
Int. on $7435 for 5 mo. at 6% = $185.875
The interest at 3% = ½ of $185.875 = $92.94.

9. Int. on $2000 for 3 mo. at 6% = $30.00
Int. on 400 for 3 mo. at 6% = 6.00
Int. on 60 for 3 mo. at 6% = .90
Int. on 7 for 3 mo. at 6% = .105
Int. on $2467 for 3 mo. at 6% = $37.005
The interest at 5% = $37.005 − ⅙ of $37.005 = $30.84.

10. 8 mo. 3 mo.
Int. on $5000 at 6% = $200.00 + $75.00
Int. on 700 at 6% = 28.00 + 10.50
Int. on 60 at 6% = 2.40 + .90
Int. on 2 at 6% = .08 + .03
Int. on $5762 at 6% = $230.48 + $86.43 = $316.91
The interest at 4½% = $316.91 − ¼ of $316.91 = $237.68.

11. Int. on $3000 for 10 da. at 6% = $5.00
Int. on 800 for 10 da. at 6% = 1.333
Int. on 40 for 10 da. at 6% = .067
Int. on $3840 for 10 da. at 6% = $6.40
The interest at 5% = $6.40 − ⅙ of $6.40 = $5.33.

12. Int. on $4000 for 15 da. at 6% = $10.00
Int. on 70 for 15 da. at 6% = .175
Int. on $4070 for 15 da. at 6% = $10.175
The interest at 4% = $10.175 − ⅓ of $10.175 = $6.78.

13. 20 da. 1 da.
Int. on $3000 at 6% = $10.00 + $.50
Int. on 100 at 6% = .333 + .017
Int. on 70 at 6% = .233 + .012
Int. on 5 at 6% = .017 + .001
Int. on $3175 at 6% = $10.583 + $.530 = $11.113
The interest at 3% = ½ of $11.113 = $5.56.

14. By subtracting dates the time = 1 yr. 1 mo. 11 da.

1 yr. 1 mo. 11 da.

Int. on $5000 at 6% = $300 + $25 + $9.167 = $334.167

The interest at 4% = $334.167 − ⅓ of $334.167 = $222.78.

15. By subtracting dates the time = 2 yr. 2 mo. 26 da.

2 yr. 2 mo. 20 da. 6 da.

Int. on $8000 at 6% = $960.00 + $80.00 + $26.667 + $8.00

Int. on 40 at 6% = 4.80 + .40 + .133 + .04

Int. on $8040 at 6% = $964.80 + $80.40 + $26.800 + $8.04 = $1080.04

16. By subtracting dates the time = 2 yr. 9 mo. 23 da.

2 yr. 8 mo. 1 mo. 20 da. 3 da.

Int. on $5000.00 at 6% = $600.00 + $200.00 + $25.00 + $16.667 + $2.50

Int. on 300.00 at 6% = 36.00 + 12.00 + 1.50 + 1.000 + .15

Int. on 40.00 at 6% = 4.80 + 1.60 + .20 + .133 + .02

Int. on .20 at 6% = .024 + .008 + .001 + .001

Int. on .05 at 6% = .006 + .002

Int. on $5340.25 at 6% = $640.830 + $213.610 + $26.701 + $17.801 + $2.67 = $901.612

The interest at 5% = $901.612 − ⅙ of $901.612 = $751.34.

17. By subtracting dates the time = 3 yr. 10 mo. 18 da.

3 yr. 8 mo. 2 mo. 18 da.

Int. on $8000.00 at 6% = $1440.00 + $320.00 + $80.00 + $24.00

Int. on 200.00 at 6% = 36.00 + 8.00 + 2.00 + .60

Int. on 50.00 at 6% = 9.00 + 2.00 + .50 + .15

Int. on 7.00 at 6% = 1.26 + .28 + .07 + .021

Int. on .70 at 6% = .126 + .028 + .007 + .002

Int. on .05 at 6% = .009 + .002 + .001

Int. on $8257.75 at 6% = $1486.395 + $330.310 + $82.578 + $24.773 = $1924.056

The interest at 4½% = $1924.056 − ¼ of $1924.056 = $1443.04.

18. The time from Jan. 16 to Mar. 10 in a leap year = 54 da.

20 da. 20 da. 14 da.

Int. on $3000.00 at 6% = $10.00 + $10.00 + $7.00

Int. on 300.00 at 6% = 1.00 + 1.00 + .70

Int. on 70.00 at 6% = .233 + .233 + .163

Int. on 5.00 at 6% = .017 + .017 + .012

Int. on .40 at 6% = .001 + .001 + .001

Int. on .05 at 6% =

Int. on $3375.45 at 6% = $11.251 + $11.251 + $7.876 = $30.378

The interest at 3% = ½ of $30.378 = $15.19.

Page 240

1. 20)$64.40, int. for 60 da. at 6%
+ 3.22, int. for 3 da. at 6%
$67.62, int. for 63 da. at 6%
The interest at 4 % = $67.62 − ⅓ of $67.62 = $45.08.
The interest at 4½% = $67.62 − ¼ of $67.62 = $50.71½.
The interest at 3 % = ½ of $67.62 = $33.81.
The interest at 5 % = $67.62 − ⅙ of $67.62 = $56.35.

2. 4)$32.00, int. for 60 da. at 6%
+ 8.00, int. for 15 da. at 6%
$40.00, int. for 75 da. at 6%
The interest at 4 % = $40 − ⅓ of $40 = $26.67.
The interest at 4½% = $40 − ¼ of $40 = $30.
The interest at 3 % = ½ of $40 = $20.
The interest at 5 % = $40 − ⅙ of $40 = $33.33.

3. By the table, p. 238, the interest at 6% = $1.667, or $1.67.
The interest at 4 % = $1.667 − ⅓ of $1.667 = $1.11.
The interest at 4½% = $1.667 − ¼ of $1.667 = $1.25.
The interest at 3 % = ½ of $1.667 = $.83.
The interest at 5 % = $1.667 − ⅙ of $1.667 = $1.39.

4. By the table, p. 238, the interest at 6% = $4.167, or $4.17.
The interest at 4 % = $4.167 − ⅓ of $4.167 = $2.78.
The interest at 4½% = $4.167 − ¼ of $4.167 = $3.12½.
The interest at 3 % = ½ of $4.167 = $2.08.
The interest at 5 % = $4.167 − ⅙ of $4.167 = $3.47.

5. By the table, p. 238, the interest at 6% = $8.333, or $8.33.
The interest at 4 % = $8.333 − ⅓ of $8.333 = $5.56.
The interest at 4½% = $8.333 − ¼ of $8.333 = $6.25.
The interest at 3 % = ½ of $8.333 = $4.17.
The interest at 5 % = $8.333 − ⅙ of $8.333 = $6.94.

6. 2)$50.00, int. for 60 da. at 6%
$25.00, int. for 30 da. at 6%
The interest at 4% = $25 − ⅓ of $25 = $16.67.
The interest at 4½% = $25 − ¼ of $25 = $18.75.
The interest at 3 % = ½ of $25 = $12.50.
The interest at 5% = $25 − ⅙ of $25 = $20.83.

7. $50.00, int. for 60 da. at 6%

The interest at 4 % = $50 – ⅓ of $50 = $33.33.
The interest at 4½% = $50 – ¼ of $50 = $37.50.
The interest at 3 % = ½ of $50 = $25.
The interest at 5 % = $50 – ⅙ of $50 = $41.67.

8. 2)$50.00, int. for 60 da. at 6%
+25.00, int. for 30 da. at 6%
$75.00, int. for 90 da. at 6%

The interest at 4 % = $75 – ⅓ of $75 = $50.
The interest at 4½% = $75 – ¼ of $75 = $56.25.
The interest at 3 % = ½ of $75 = $37.50.
The interest at 5 % = $75 – ⅙ of $75 = $62.50.

9. $50.00, int. for 60 da. at 6%
+50.00, int. for 60 da. at 6%
$100.00, int. for 120 da. at 6%

The interest at 4 % = $100 – ⅓ of $100 = $66.67.
The interest at 4½% = $100 – ¼ of $100 = $75.
The interest at 3 % = ½ of $100 = $50.
The interest at 5 % = $100 – ⅙ of $100 = $83.33.

10. $50.00, int. for 60 da. at 6%
12)50.00, int. for 60 da. at 6%
+4.167, int. for 5 da. at 6%
$104.17, int. for 125 da. at 6%

The interest at 4 % = $104.167 – ⅓ of $104.167 = $69.44.
The interest at 4½% = $104.167 – ¼ of $104.167 = $78.12½.
The interest at 3 % = ½ of $104.167 = $52.08.
The interest at 5 % = $104.167 – ⅙ of $104.167 = $86.81.

11.

$$\overset{\$.0222}{\$.\cancel{1}\cancel{3}\cancel{3}\cancel{2}} \times \frac{21}{\cancel{6}} = \$.4662, \text{ or } \$.47, \text{ int. at } 6\%$$

The interest at 4 % = $.466 – ⅓ of $.466 = $.31.
The interest at 4½% = $.466 – ¼ of $.466 = $.35.
The interest at 3 % = ½ of $.466 = $.23.
The interest at 5 % = $.466 – ⅙ of $.466 = $.39.

12.

$$\overset{\$.39316}{\$.\cancel{7}\cancel{8}\cancel{6}\cancel{3}\cancel{2}} \times \frac{\overset{9}{\cancel{27}}}{\underset{\cancel{2}}{\cancel{6}}} = \$3.53844, \text{ or } \$3.54, \text{ int. at } 6\%$$

The interest at 4 % = $3.538 – ⅓ of $3.538 = $2.36.
The interest at 4½% = $3.538 – ¼ of $3.538 = $2.65.
The interest at 3 % = ½ of $3.538 = $1.77.
The interest at 5 % = $3.538 – ⅙ of $3.538 = $2.95.

13.

$$\overset{\$.0721}{\$.\cancel{4}\cancel{3}\cancel{2}\cancel{6}} \times \frac{11}{\cancel{6}} = \$.7931\text{, or }\$.79\text{, int. at }6\,\%$$

The interest at 4 % = $.793 − ⅓ of $.793 = $.53.
The interest at 4½ % = $.7931 − ¼ of $.7931 = $.59.
The interest at 3 % = ½ of $.793 = $.40.
The interest at 5 % = $.793 − ⅙ of $.793 = $.66.

14.

20)$6.3580, int. for 60 da. at 6 %
− .3179, int. for 3 da. at 6 %
$6.04 , int. for 57 da. at 6 %
The interest at 4 % = $6.04 − ⅓ of $6.04 = $4.03.
The interest at 4½ % = $6.04 − ¼ of $6.04 = $4.53.
The interest at 3 % = ½ of $6.04 = $3.02.
The interest at 5 % = $6.04 − ⅙ of $6.04 = $5.03.

15.

2)$7.5219, int. for 60 da. at 6 %
10) 3.7609, int. for 30 da. at 6 %
+ .3761, int. for 3 da. at 6 %
$11.6589, int. for 93 da. at 6 % = $11.66
The interest at 4 % = $11.659 − ⅓ of $11.659 = $7.77.
The interest at 4½ % = $11.659 − ¼ of $11.659 = $8.74.
The interest at 3 % = ½ of $11.659 = $5.83.
The interest at 5 % = $11.659 − ⅙ of $11.659 = $9.72.

16.

Int. on $1 for 3 mo. at 6 % = $.015
Int. on $1 for 18 da. at 6 % = .003
Int. on $1 for 3 mo. 18 da. at 6 % = $.018
The interest on $563.22 at 6 % = 563.22 × $.018 = $10.138⁻, or $10.14.
The interest at 4 % = $10.138 − ⅓ of $10.138 = $6.76.
The interest at 4½ % = $10.138 − ¼ of $10.138 = $7.60.
The interest at 3 % = ½ of $10.138 = $5.07.
The interest at 5 % = $10.138 − ⅙ of $10.138 = $8.45.

17.

Int. on $1 for 5 mo. at 6 % = $.025
Int. on $1 for 12 da. at 6 % = .002
Int. on $1 for 5 mo. 12 da. at 6 % = $.027
The interest on $287.10 = 287.10 × $.027 = $7.7517, or $7.75.
The interest at 4 % = $7.752 − ⅓ of $7.752 = $5.17.
The interest at 4½ % = $7.752 − ¼ of $7.752 = $5.81.
The interest at 3 % = ½ of $7.752 = $3.88.
The interest at 5 % = $7.752 − ⅙ of $7.752 = $6.46.

18. By the table, p. 238: 1 yr. 2 mo. 9 da.
Int. on $1000 at 6% = $60 + $10 + $1.50 = $71.50
The interest at 4 % = $71.50 − ⅓ of $71.50 = $47.67.
The interest at 4½ % = $71.50 − ¼ of $71.50 = $53.62½.
The interest at 3 % = ½ of $71.50 = $35.75.
The interest at 5 % = $71.50 − ⅙ of $71.50 = $59.58.

19. By the table, p. 238: 2 yr. 7 mo. 3 da.

$$\begin{array}{l} \text{Int. on } \$1000 \text{ at } 6\% = \$120 + \$35 + \$.50 \\ \text{Int. on } \underline{\quad 200} \text{ at } 6\% = \underline{\quad 24} + \underline{\quad 7} + \underline{.10} \\ \text{Int. on } \$1200 \text{ at } 6\% = \$144 + \$42 + \$.60 = \$186.60 \end{array}$$

The interest at 4 % = $186.60 − ⅓ of $186.60 = $124.40.
The interest at 4½ % = $186.60 − ¼ of $186.60 = $139.95.
The interest at 3 % = ½ of $186.60 = $93.30.
The interest at 5 % = $186.60 − ⅙ of $186.60 = $155.50.

20. The time from Feb. 1 to Feb. 28 = 27 da.

$$\$16.000 \times \frac{27}{6} = \$72, \text{ int. at } 6\%$$

The interest at 4 % = $72 − ⅓ of $72 = $48.
The interest at 4½ % = $72 − ¼ of $72 = $54.
The interest at 3 % = ½ of $72 = $36.
The interest at 5 % = $72 − ⅙ of $72 = $60.

21. The time from Jan. 10 to Jan. 20 = 10 da.

$$\$45.000 \times \frac{10}{6} = \$75, \text{ int. at } 6\%$$

The interest at 4 % = $75 − ⅓ of $75 = $50.
The interest at 4½ % = $75 − ¼ of $75 = $56.25.
The interest at 3 % = ½ of $75 = $37.50.
The interest at 5 % = $75 − ⅙ of $75 = $62.50.

22. The time from June 7 to July 1 = 24 da.

$$\$500.000 \times \frac{24}{6} = \$2000, \text{ int. at } 6\%$$

The interest at 4 % = $2000 − ⅓ of $2000 = $1333.33.
The interest at 4½ % = $2000 − ¼ of $2000 = $1500.
The interest at 3 % = ½ of $2000 = $1000.
The interest at 5 % = $2000 − ⅙ of $2000 = $1666.67.

23. $25,000.00, int. for 60 da. at 6%
The interest at 4 % = $25,000 − ⅓ of $25,000 = $16,666.67.
The interest at 4½ % = $25,000 − ¼ of $25,000 = $18,750.
The interest at 3 % = ½ of $25,000 = $12,500.
The interest at 5 % = $25,000 − ⅙ of $25,000 = $20,833.33.

24. $2\underline{)\$\,132{,}000.00}$, int. for 60 da. at 6%
$\$\,66{,}000.00$, int. for 30 da. at 6%
The interest at 4 % = $\$\,66{,}000 - \frac{1}{3}$ of $\$\,66{,}000 = \$\,44{,}000$.
The interest at $4\frac{1}{2}$% = $\$\,66{,}000 - \frac{1}{4}$ of $\$\,66{,}000 = \$\,49{,}500$.
The interest at 3 % = $\frac{1}{2}$ of $\$\,66{,}000 = \$\,33{,}000$.
The interest at 5 % = $\$\,66{,}000 - \frac{1}{6}$ of $\$\,66{,}000 = \$\,55{,}000$.

25. $\frac{1}{4}$ of $\$\,50{,}000 = \$\,12{,}500$; 7% of $\$\,12{,}500 = \$\,875$;
$\$\,50{,}000 - \$\,12{,}500 = \$\,37{,}500$; 5% of $\$\,37{,}500 = \$\,1875$;
$\$\,875 + \$\,1875 = \$\,2750$, his annual income.

26. 8% – 5% = 3%, his gain per cent;
3% of $75,000 = $2250, his annual gain.

27. In 6 mo. the interest on $3.20 at 5% would have been $.08; hence, the real cost of the coal per ton = $\$\,3.20 + \$\,.08 = \$\,3.28$.

28. The interest on $10,000 for 12 yr. at 15% = $18,000;
The interest on $10,000 for 12 yr. at 4% = $4800;
The amount of $10,000 for 12 yr. at 4% = $14,800;
Therefore he was $18,000 – $14,800, or $3200, better off.

Page 241

1. $.06 \times \$\,200 \times \frac{90}{365} = \$\,2.96$

2. $.06 \times \$\,500 \times \frac{33}{365} = \$\,2.71$

3. $.05 \times \$\,750 \times \frac{60}{365} = \$\,6.16$

4. $.04 \times \$\,480 \times \frac{45}{365} = \$\,2.37$

9. From Mar. 2 to July 15 = 135 da.
$.06 \times \$\,150 \times \frac{135}{365} = \$\,3.33$

10. From Aug. 1 to Dec. 1 = 122 da.
$.06 \times \$\,444 \times \frac{122}{365} = \$\,8.90$

11. From May 1 to Nov. 1 = 184 da.
$.06 \times \$\,765 \times \frac{184}{365} = \$\,23.14$

12. From June 1 to Dec. 1 = 183 da.
$.06 \times \$\,480 \times \frac{183}{365} = \$\,14.44$

5. $.03 \times \$\,5000 \times \frac{120}{365} = \$\,49.32$

6. $.04 \times \$\,6400 \times \frac{111}{365} = \$\,77.85$

7. $.05 \times \$\,7200 \times \frac{214}{365} = \$\,211.07$

8. $.045 \times \$\,8100 \times \frac{179}{365} = \$\,178.75$

13. From Apr. 1 to Oct. 1 = 183 da.
$.06 \times \$\,5000 \times \frac{183}{365} = \$\,150.41$

14. From May 1 to Nov. 1 = 184 da.
$.06 \times \$\,5000 \times \frac{184}{365} = \$\,151.23$

15. From June 1 to Nov. 4 = 156 da.
$.06 \times \$\,4640 \times \frac{156}{365} = \$\,118.99$

16. From July 6 to Dec. 9 = 156 da.
$.06 \times \$\,3875 \times \frac{156}{365} = \$\,99.37$

17. The time from June 15 to Sept. 15 = 92 da.
By the cancellation method the ordinary interest =

$$\$\,10.000 \times \frac{92}{6} \times \frac{1}{2} = \$\,76.67$$

Then the accurate interest is $\frac{1}{73}$ of $76.67, or $1.05, less.

18. The time from Mar. 1 to July 1 = 122 da.
By the cancellation method the ordinary interest =

$$\$2500.000 \times \frac{122}{6} \times \frac{3}{4} = \$38,125$$

Then the accurate interest is $\frac{1}{73}$ of $38,125, or $522.26, less.

Page 242

2. The interest on $300 at 1% for 4 yr. is 4% of $300, or $12.
Since a rate of 1% yields $12, it will require a rate of as many per cent to yield $60 as $12 is contained times in $60, or 5%.

3. The interest on $500 at 1% for 3 yr. is 3% of $500, or $15.
Since a rate of 1% yields $15, it will require a rate of as many per cent to yield $90 as $15 is contained times in $90, or 6%.

4. The interest on $700 at 1% for 2½ yr. is 2½% of $700, or $17.50.
Since a rate of 1% yields $17.50, it will require a rate of as many per cent to yield $70 as $17.50 is contained times in $70, or 4%.

5. The interest on $500 at 1% for 5¼ yr. is 5¼% of $500, or $26.25.
Since a rate of 1% yields $26.25, it will require a rate of as many per cent to yield $105 as $26.25 is contained times in $105, or 4%.

6. The interest on $900 at 1% for 3⅓ yr. is 3⅓% of $900, or $30.
Since a rate of 1% yields $30, it will require a rate of as many per cent to yield $180 as $30 is contained times in $180, or 6%.

Page 243

7. The interest on $150 at 1% for 4½ yr. is 4½% of $150, or $6.75.
Since a rate of 1% yields $6.75, it requires a rate of as many per cent to yield $33.75 as $6.75 is contained times in $33.75, or 5%.

8. The interest on $225 at 1% for 5⅔ yr. is 5⅔% of $225, or $12.75.
Since a rate of 1% yields $12.75, it requires a rate of as many per cent to yield $76.50 as $12.75 is contained times in $76.50, or 6%.

9. 3 yr. 1 mo. 15 da. = 3 yr. 1½ mo. = 3⅛ yr.
The interest on $3200 at 1% for 3⅛ yr. is 3⅛% of $3200, or $100.
Since a rate of 1% yields $100, it requires a rate of as many per cent to yield $400 as $100 is contained times in $400, or 4%.

10. 6 yr. 4 mo. 24 da. = 6 yr. 4⅘ mo. = 6⅖ yr.
The interest on $4500 at 1% for 6⅖ yr. is 6⅖% of $4500, or $288.
Since a rate of 1% yields $288, it requires a rate of as many per cent to yield $1296 as $288 is contained times in $1296, or 4½%.

11. The interest on \$3200 at 1% for $\frac{1}{2}$ yr. is $\frac{1}{2}$% of \$3200, or \$16.
Since a rate of 1% would yield \$16, it required a rate of as many per cent to yield \$56 as \$16 is contained times in \$56, or $3\frac{1}{2}$%.

12. The interest = \$3050 − \$3000 = \$50.
The interest on \$3000 at 1% for $\frac{1}{3}$ yr. is $\frac{1}{3}$% of \$3000, or \$10.
Since a rate of 1% would yield \$10, it required a rate of as many per cent to yield \$50 as \$10 is contained times in \$50, or 5%.

13. The interest = \$720 − \$600 = \$120.
The interest on \$600 at 1% for 4 yr. is 4% of \$600, or \$24.
Since a rate of 1% yields \$24, it will require a rate of as many per cent to yield \$120 as \$24 is contained times in \$120, or 5%.

14. The net annual income = \$576 − \$157.50 = \$418.50.
The interest on \$5400 at 1% for 1 yr. is 1% of \$5400, or \$54.
Since a rate of 1% would yield \$54, it required a rate of as many per cent to yield \$418.50 as \$54 is contained times in \$418.50, or $7\frac{3}{4}$%.

15. \$8187.50 ÷ \$25,000 = .3275; that is, the profits were .3275, or $32\frac{3}{4}$%, of the investment.

Page 244

2. The total interest = \$1000 − \$600 = \$400;
The interest for 1 yr. at 8% is 8% of \$600, or \$48;
Hence, the time required is $\frac{400}{48}$ yr., or $8\frac{1}{3}$ yr., or 8 yr. 4 mo.

3. The total interest = \$1000 − \$800 = \$200;
The interest for 1 yr. at 5% is 5% of \$800, or \$40;
Hence, the time required is $\frac{200}{40}$ yr., or 5 yr.

4. The total interest = \$1000 − \$900 = \$100;
The interest for 1 yr. at 4% is 4% of \$900, or \$36;
Hence, the time required is $\frac{100}{36}$ yr., or $2\frac{7}{9}$ yr., or 2 yr. 9 mo. 10 da.

5. The total interest = \$1000 − \$840 = \$160;
The interest for 1 yr. at 6% is 6% of \$840, or \$50.40;
Hence, the number of years required = \$160 ÷ \$50.40, or $3\frac{11}{63}$ yr., or 3 yr. 2 mo. 3 da.

6. The total interest = \$1000 − \$625 = \$375;
The interest for 1 yr. at $4\frac{1}{2}$% is $4\frac{1}{2}$% of \$625, or \$28.125;
Hence, the number of years required = \$375 ÷ \$28.125, or $13\frac{1}{3}$ yr., or 13 yr. 4 mo.

7. The total interest = \$1000 − \$875 = \$125;
The interest for 1 yr. at $3\frac{1}{2}$% is $3\frac{1}{2}$% of \$875, or \$30.625;
Hence, the number of years required = \$125 ÷ \$30.625, or $4\frac{4}{49}$ yr., or 4 yr. 1 mo.

8. When the interest is 4% of the principal in 1 yr., it will become 100% of the principal in as many years as 4% is contained times in 100%, or 25 yr.

When the interest is 5% it will equal the principal in as many years as 5% is contained times in 100%, or 20 yr.

When the interest is 2% it will equal the principal in as many years as 2% is contained times in 100%, or 50 yr.

When the interest is 6% it will equal the principal in as many years as 6% is contained times in 100%, or $16\frac{2}{3}$ yr.

When the interest is $4\frac{1}{2}$% it will equal the principal in as many years as $4\frac{1}{2}$% is contained times in 100%, or $22\frac{2}{9}$ yr.

9. When any principal trebles itself it is 300% of itself, and the interest is 300% – 100%, or 200%, of the principal. If the interest is 5% per year, it will become 200% of the principal in as many years as 5% is contained times in 200%, or 40 yr.

---

2. Since $1 at 5% interest yields $.05 per year, as many dollars are required to yield an annual income of $125 as $.05 is contained times in $125, or $2500.

3. Since $1 at 4% interest yields $.04 per year, as many dollars are required to yield an annual income of $500 as $.04 is contained times in $500, or $12,500.

4. Since $1 at 6% interest yields $.06 per year, as many dollars are required to yield an annual income of $750 as $.06 is contained times in $750, or $12,500.

5. Since $1 at $4\frac{1}{2}$% interest yields $.045 per year, as many dollars are required to yield an annual income of $900 as $.045 is contained times in $900, or $20,000.

6. Since $1 at 2% interest yields $.02 per year, as many dollars are required to yield an annual income of $1000 as $.02 is contained times in $1000, or $50,000.

7. Since $1 at $7\frac{1}{2}$% interest yields $.075 per year, as many dollars are required to yield an annual income of $3000 as $.075 is contained times in $3000, or $40,000.

Page 245

8. Since $1 at 5% interest yields $.20 in 4 yr., as many dollars are required to yield $375 in that time as $.20 is contained times in $375, or $1875.

9. Since $1 at 6% interest yields $.12 in 2 yr., as many dollars are required to yield $900 in that time as $.12 is contained times in $900, or $7500.

10. Since $1 at 3% interest yields $.21 in 7 yr., as many dollars are required to yield $840 in that time as $.21 is contained times in $840, or $4000.

11. Since $1 at 4% interest yields $.10 in 2 yr. 6 mo., as many dollars are required to yield $500 in that time as $.10 is contained times in $500, or $5000.

12. Since $1 at 6% interest yields $.20 in 3 yr. 4 mo., as many dollars are required to yield $480 in that time as $.20 is contained times in $480, or $2400.

13. Since $1 at 5% interest yields $.00⅚ in 60 da., as many dollars are required to yield $1000 in that time as $.00⅚ is contained times in $1000, or $120,000.

14. Since $1 at 4% interest yields $.04 per year, as many dollars are required to provide an annual income of $3000 as $.04 is contained times in $3000, or $75,000. Hence, he shall insure his life for $75,000.

15. Since $1 at 3½% interest yields $.035 per year, as many dollars are required to provide 10 × $350, or $3500, per year as $.035 is contained times in $3500, or $100,000. Hence, the amount of the endowment was $100,000.

Page 246

2. Since $1 at 6% interest would amount to $1.01 in 60 da., it would require as many dollars now to amount to $800 in 60 da. as $1.01 is contained times in $800, or $792.08. Hence, the equivalent cash value of $800 due in 60 da. was $792.08.

3. Since $1 at 6% interest would amount to $1.15 in 2 yr. 6 mo., it will require as many dollars now to amount to $1000 in 2 yr. 6 mo. as $1.15 is contained times in $1000, or $869.57, the present worth.

4. Since $1 at 5% interest will amount to $1.025 in 6 mo., it will require as many dollars now to amount to $5000 in 6 mo. as $1.025 is contained times in $5000, or $4878.05, the present worth.

Then the true discount = $5000 − $4878.05 = $121.95.

5. Since $1 at 3½% interest amounts to $1.02625 in 9 mo., it requires as many dollars now to amount to $1642 in 9 mo. as $1.02625 is contained times in $1642, or $1600.

6. Since $1 at 5% interest will amount to $1.05 in 1 yr., it requires as many dollars now to amount to $5000 1 yr. hence as $1.05 is contained times in $5000, or $4761.90, the present worth.

7. Since $1 at 6% interest will amount to $1.05 in 10 mo., it will require as many dollars now to amount to $5000 in 10 mo. as $1.05 is contained times in $5000, or $4761.90, the present value of the policy.

Page 247

8. Since $1 at 4% interest would amount to $1.01 in 90 da., it will require as many dollars now to amount to $2500 in 90 da. as $1.01 is contained times in

$2500, or $2475.25⁻; that is, the present worth of $2500 payable in 90 da. is $2475.25.

Since the discount for cash payment is 1½% of $2500, or $37.50, the net cash payment = $2500 − $37.50, or $2462.50.

Therefore, by paying cash I shall save $2475.25 − $2462.50, or $12.75.

9. Since $1 at 6% interest will amount to $1.06 in a year, it will require as many dollars now to amount to $3000 in 1 yr. as $1.06 is contained times in $3000, or $2830.19, the present worth; hence, with money at 6%, the present value of Mr. White's offer is $6000 + $2830.19, or $8830.19. Therefore, when money is worth 6% Mr. White's offer is better by $8830.19 − $8800, or $30.19.

Since $1 at 8% interest will amount to $1.08 in 1 yr., it will require as many dollars now to amount to $3000 in 1 yr. as $1.08 is contained times in $3000, or $2777.78, the present worth; hence, with money at 8%, the present value of Mr. White's offer is $6000 + $2777.78, or $8777.78. Therefore, when money is worth 8%, Mr. Brown's offer is better by $8800 − $8777.78, or $22.22.

---

2. Principal		$5850	
Interest on $5850 at 4% for 4 yr. 3 mo.		994	50
The 1st annual int., $234, remains unpaid for	3 yr. 3 mo.		
The 2d annual int., $234, remains unpaid for	2 yr. 3 mo.		
The 3d annual int., $234, remains unpaid for	1 yr. 3 mo.		
The 4th annual int., $234, remains unpaid for	3 mo.		
Interest on $234 at 4% for . . .	7 yr. =	65	52
Amount of $5850		$6910	02

3. Principal		$24,000	
Interest on $24,000 for 3 yr. 3 mo. 12 da. at 5%		3,940	
The 1st annual int., $1200, remains unpaid for	2 yr. 3 mo. 12 da.		
The 2d annual int., $1200, remains unpaid for	1 yr. 3 mo. 12 da.		
The 3d annual int., $1200, remains unpaid for	3 mo. 12 da.		
Interest on $1200 at 5% for	3 yr. 10 mo. 6 da. =	231	
Amount of $24,000		$28,171	

Page 249

2. Principal	$400
Interest for 1st yr. at 5%	20
Principal beginning 2d yr.	$420
Interest for 2d yr. at 5%	21
Amount for 2 yr. at 5%	$441

The compound interest = $441 − $400, or $41.

11. Since $1 at 4% interest yields $.10 in 2 yr. 6 mo., as many dollars are required to yield $500 in that time as $.10 is contained times in $500, or $5000.

12. Since $1 at 6% interest yields $.20 in 3 yr. 4 mo., as many dollars are required to yield $480 in that time as $.20 is contained times in $480, or $2400.

13. Since $1 at 5% interest yields $.00⅚ in 60 da., as many dollars are required to yield $1000 in that time as $.00⅚ is contained times in $1000, or $120,000.

14. Since $1 at 4% interest yields $.04 per year, as many dollars are required to provide an annual income of $3000 as $.04 is contained times in $3000, or $75,000. Hence, he shall insure his life for $75,000.

15. Since $1 at 3½% interest yields $.035 per year, as many dollars are required to provide 10 × $350, or $3500, per year as $.035 is contained times in $3500, or $100,000. Hence, the amount of the endowment was $100,000.

Page 246

2. Since $1 at 6% interest would amount to $1.01 in 60 da., it would require as many dollars now to amount to $800 in 60 da. as $1.01 is contained times in $800, or $792.08. Hence, the equivalent cash value of $800 due in 60 da. was $792.08.

3. Since $1 at 6% interest would amount to $1.15 in 2 yr. 6 mo., it will require as many dollars now to amount to $1000 in 2 yr. 6 mo. as $1.15 is contained times in $1000, or $869.57, the present worth.

4. Since $1 at 5% interest will amount to $1.025 in 6 mo., it will require as many dollars now to amount to $5000 in 6 mo. as $1.025 is contained times in $5000, or $4878.05, the present worth.

Then the true discount = $5000 – $4878.05 = $121.95.

5. Since $1 at 3½% interest amounts to $1.02625 in 9 mo., it requires as many dollars now to amount to $1642 in 9 mo. as $1.02625 is contained times in $1642, or $1600.

6. Since $1 at 5% interest will amount to $1.05 in 1 yr., it requires as many dollars now to amount to $5000 1 yr. hence as $1.05 is contained times in $5000, or $4761.90, the present worth.

7. Since $1 at 6% interest will amount to $1.05 in 10 mo., it will require as many dollars now to amount to $5000 in 10 mo. as $1.05 is contained times in $5000, or $4761.90, the present value of the policy.

Page 247

8. Since $1 at 4% interest would amount to $1.01 in 90 da., it will require as many dollars now to amount to $2500 in 90 da. as $1.01 is contained times in

$2500, or $2475.25−; that is, the present worth of $2500 payable in 90 da. is $2475.25.

Since the discount for cash payment is 1½% of $2500, or $37.50, the net cash payment = $2500 − $37.50, or $2462.50.

Therefore, by paying cash I shall save $2475.25 − $2462.50, or $12.75.

9. Since $1 at 6% interest will amount to $1.06 in a year, it will require as many dollars now to amount to $3000 in 1 yr. as $1.06 is contained times in $3000, or $2830.19, the present worth; hence, with money at 6%, the present value of Mr. White's offer is $6000 + $2830.19, or $8830.19. Therefore, when money is worth 6% Mr. White's offer is better by $8830.19 − $8800, or $30.19.

Since $1 at 8% interest will amount to $1.08 in 1 yr., it will require as many dollars now to amount to $3000 in 1 yr. as $1.08 is contained times in $3000, or $2777.78, the present worth; hence, with money at 8%, the present value of Mr. White's offer is $6000 + $2777.78, or $8777.78. Therefore, when money is worth 8%, Mr. Brown's offer is better by $8800 − $8777.78, or $22.22.

---

2. Principal		$5850	
Interest on $5850 at 4% for 4 yr. 3 mo.		994	50
The 1st annual int., $234, remains unpaid for	3 yr. 3 mo.		
The 2d annual int., $234, remains unpaid for	2 yr. 3 mo.		
The 3d annual int., $234, remains unpaid for	1 yr. 3 mo.		
The 4th annual int., $234, remains unpaid for	3 mo.		
Interest on $234 at 4% for	7 yr. =	65	52
Amount of $5850		$6910	02

3. Principal		$24,000	
Interest on $24,000 for 3 yr. 3 mo. 12 da. at 5%		3,940	
The 1st annual int., $1200, remains unpaid for	2 yr. 3 mo. 12 da.		
The 2d annual int., $1200, remains unpaid for	1 yr. 3 mo. 12 da.		
The 3d annual int., $1200, remains unpaid for	3 mo. 12 da.		
Interest on $1200 at 5% for	3 yr. 10 mo. 6 da. =	231	
Amount of $24,000		$28,171	

Page 249

2. Principal	$400
Interest for 1st yr. at 5%	20
Principal beginning 2d yr.	$420
Interest for 2d yr. at 5%	21
Amount for 2 yr. at 5%	$441

The compound interest = $441 − $400, or $41.

3.

Principal	$1000
Interest for 1st yr. at 4%	40
Principal beginning 2d yr.	$1040
Interest for 2d yr. at 4%	41.60
Principal beginning 3d yr.	$1081.60
Interest for 3d yr. at 4%	43.264
Amount for 3 yr. at 4%	$1124.86

The compound interest = $1124.86 – $1000, or $124.86.

4.

Principal	$1500
Interest for 1st yr. at 6%	90
Principal beginning 2d yr.	$1590
Interest for 2d yr. at 6%	95.40
Principal beginning 3d yr.	$1685.40
Interest for 3d yr. at 6%	101.124
Principal beginning 4th yr.	$1786.524
Interest for 4th yr. at 6%	107.1914+
Principal beginning 5th yr.	$1893.7154
Interest for 6 mo. at 6%	56.8115–
Amount for 4 yr. 6 mo. at 6%	$1950.53

The compound interest = $1950.53 – $1500, or $450.53.

5. There are 4 interest periods, each with a rate of 3%.

Principal	$5000
Interest for 1st period at 3%	150
Principal beginning 2d period	$5150
Interest for 2d period at 3%	154.50
Principal beginning 3d period	$5304.50
Interest for 3d period at 3%	159.135
Principal beginning 4th period	$5463.635
Interest for 4th period at 3%	163.9091–
Amount for 2 yr. at 6% per year, semiannually	$5627.54

The compound interest = $5627.54 – $5000, or $627.54.

6. The rate is 1½% for each of the 8 interest periods.

Principal	$5000
Interest for 1st period at 1½%	75
Principal beginning 2d period	$5075
Interest for 2d period at 1½%	76.125
Principal beginning 3d period	$5151.125
Interest for 3d period at 1½%	77.2669–
Principal beginning 4th period	$5228.3919
Interest for 4th period at 1½%	78.4259–
Principal beginning 5th period	$5306.8178

Amount brought forward	$5306.8178
Interest for 5th period at 1½ %	79.6023−
Principal beginning 6th period	$5386.4201
Interest for 6th period at 1½ %	80.7963+
Principal beginning 7th period	$5467.2164
Interest for 7th period at 1½ %	82.0082+
Principal beginning 8th period	$5549.2246
Interest for 8th period at 1½ %	83.2384−
Amount for 2 yr. at 6% per year, quarterly	$5632.46

The compound interest = $5632.46 − $5000, or $632.46.

7. There are 6 whole interest periods, each with a rate of 1 %, and a partial period of 2 mo.

Principal	$8000
Interest for 1st period at 1 %	80
Principal beginning 2d period	$8080
Interest for 2d period at 1 %	80.80
Principal beginning 3d period	$8160.80
Interest for 3d period at 1 %	81.608
Principal beginning 4th period	$8242.408
Interest for 4th period at 1%	82.4241−
Principal beginning 5th period	$8324.8321
Interest for 5th period at 1 %	83.2483+
Principal beginning 6th period	$8408.0804
Interest for 6th period at 1 %	84.0808+
Principal beginning partial period	$8492.1612
Interest for 2 mo. at 4% per year	56.6144+
Amount for 1 yr. 8 mo. at 4% per year, quarterly	$8548.78

The compound interest = $8548.78 − $8000, or $548.78.

9. The amount of $1 at 5 % compound interest for 10 yr. = $1.628895;
The amount of $1000 at 5 % for 10 yr. = 1000 × $1.628895, or $1628.89½.

10. The amount of $1 at 3½ % compound interest for 20 yr. = $1.989789;
The amount of $5000 at 3½ % for 20 yr. = 5000 × $1.989789, or $9948.94½.

11. The amount of $1 at 4½ % compound interest for 12 yr. = $1.695881;
The amount of $3250 at 4½ % for 12 yr. = 3250 × $1.695881, or $5511.61.

12. The amount of $1 at 6 % compound interest for 16 yr. = $2.540352;
The amount of $725.32 at 6 % for 16 yr. = 725.32 × $2.540352, or $1842.57.

13. The amount of $1 at 4 % compound interest for 8 yr. = $1.368569;
The simple interest on $1.368569 for 3 mo. at 4 % = $.013686− ;
The amount of $1 for 8 yr. 3 mo. = $1.368569 + $.013686, or $1.382255;
The amount of $4000 for 8 yr. 3 mo. = 4000 × $1.382255, or $5529.02.

14. The amount of $1 at 2½% compound interest for 6 yr. = $1.159693;
The simple interest on $1.159693 for 8 mo. at 2½% = $.019328;
The amount of $1 for 6 yr. 8 mo. = $1.159693 + $.019328, or $1.179021;
The amount of $6000 for 6 yr. 8 mo. = 6000 × $1.179021, or $7074.13.

15. The amount of $1 at 3% compound interest for 14 yr. = $1.512590;
The simple interest on $1.512590 for 9 mo. at 3% = $.034033;
The amount of $1 for 14 yr. 9 mo. = $1.512590 + $.034033, or $1.546623;
The amount of $7000 for 14 yr. 9 mo. = 7000 × $1.546623, or $10,826.36.

16. The amount of $1 at 6% compound interest for 18 yr. = $2.854339;
The simple interest on $2.854339 for 10 mo. 15 da. at 6% = $.149853;
The amount of $1 for 18 yr. 10 mo. 15 da. = $2.854339 + $.149853, or $3.004192;
The amount of $86.48 for 18 yr. 10 mo. 15 da. = 86.48 × $3.004191, or $259.80.

17. The amount of $1 at 4% compound interest for 15 yr. = $1.800944;
The simple interest on $1.800944 for 6 mo. 3 da. at 4% = $.036619;
The amount of $1 for 15 yr. 6 mo. 3 da. = $1.800944 + $.036619, or $1.837563;
The amount of $75.50 for 15 yr. 6 mo. 3 da. = 75.50 × $1.837563, or $138.74.

18. The amount of $5000 for 8 yr. at 6%, payable semiannually, is the same as the amount of $5000 for 16 yr. at 3%, payable annually.
The amount of $1 at 3% compound interest for 16 yr. = $1.604706;
The amount of $5000 at 3% for 16 yr. = 5000 × $1.604706, or $8023.53.

19. Since the interest at 4% is payable quarterly there are 17 whole interest periods, each with a rate of 1%, and a partial period of 1 mo. 10 da. Therefore the amount of $6500 for 4 yr. 4 mo. 10 da. at 4%, compounded quarterly, is the same as the amount of $6500 for 17 yr. at 1%, compounded annually, plus the interest on this amount for 1 mo. 10 da. at 4%.
The amount of $1 at 1% compound interest for 17 yr. = $1.184304;
The simple interest on $1.184304 for 1 mo. 10 da. at 4% = $.005264;
The amount of $1 for 4 yr. 4 mo. 10 da. = $1.184304 + $.005264, or $1.189568;
The amount of $6500 for 4 yr. 4 mo. 10 da. = 6500 × $1.189568, or $7732.19.

Page 256

2.	Principal, Jan. 2, 1906	$1000.00
	Int. to Apr. 2, 1906, — 3 mo.	12.50
	Amount	$1012.50
	First payment	200.00
	New principal, Apr. 2, 1906	$812.50

	Amount brought forward		$812.50
	Int. to July 2, 1906, — 3 mo.		10.16
	Amount		$822.66
	Second payment		300.00
	New principal, July 2, 1906		$522.66
	Int. to Oct. 12, 1906, — 3 mo. 10 da.		7.26
	Amount due Oct. 12, 1906		$529.92
3.	Principal, Apr. 1, 1905		$400.00
	Int. to July 1, 1905, — 3 mo.		4.00
	Amount		$404.00
	First payment		25.00
	New principal, July 1, 1905		$379.00
	Int. to Sept. 1, 1905, — 2 mo.		2.53
	Amount		$381.53
	Second payment		30.00
	New principal, Sept. 1, 1905		$351.53
	Int. to Dec. 11, 1905, — 3 mo. 10 da.		3.91
	Amount		$355.44
	Third payment		100.00
	New principal, Dec. 11, 1905		$255.44
	Int. to Apr. 5, 1906, — 3 mo. 24 da.		3.24
	Amount due Apr. 5, 1906		$258.68
4.	Principal, Nov. 1, 1904		$1600.00
	Int. to Feb. 1, 1905, — 3 mo.		24.00
	Amount		$1624.00
	First payment		60.00
	New principal, Feb. 1, 1905		$1564.00
	Int. to Oct. 20, 1905, — 8 mo. 19 da.		67.51
	Second payment (which is less than int. due)	$20.00	
	Int. from Oct. 20 to Nov. 1, — 11 da. on $1564		2.87
	Amount		$1634.38
	Third payment (to be added to second)	$400.00	420.00
	New principal, Nov. 1, 1905		$1214.38
	Int. to Apr. 10, 1906, — 5 mo. 9 da.		32.18
	Amount due Apr. 10, 1906		$1246.56
5.	Principal, Aug. 15, 1904		$4000.00
	Int. to Jan. 2, 1905, — 4 mo. 17 da.		76.11
	First payment (which is less than int. due)	$40.00	
	Int. from Jan. 2 to May 11, — 4 mo. 9 da. on $4000		71.67
	Amount		$4147.78

	Amount brought forward		$4147.78
	Second payment (to be added to first)	$500.00	540.00
	New principal, May 11, 1905		$3607.78
	Int. to June 1, 1906, — 1 yr. 20 da.		190.41
	Amount due June 1, 1906		$3798.19
6.	Principal, Feb. 28, 1903		$1250.00
	Int. to July 1, 1903, — 4 mo. 3 da.		25.63
	Amount		$1275.63
	First payment		100.00
	New principal, July 1, 1903		$1175.63
	Int. to Dec. 16, 1904, — 1 yr. 5 mo. 15 da.		102.87
	Amount		$1278.50
	Second payment		200.00
	New principal, Dec. 16, 1904		$1078.50
	Int. to Oct. 11. 1905, — 9 mo. 25 da.		53.03
	Amount		$1131.53
	Third payment		600.00
	New principal, Oct. 11, 1905		$531.53
	Int. to Apr. 4, 1906, — 5 mo. 23 da.		15.33
	Amount due Apr. 4, 1906		$546.86
7.	Principal, Oct. 22, 1904		$80.00
	Int. to Feb. 1, 1905, — 3 mo. 9 da.		.88
	Amount		$80.88
	Payment		47.00
	New principal, Feb. 1, 1905		$33.88
	Int. to July 1, 1905, — 5 mo.		.56
	Amount due July 1, 1905		$34.44

Page 257

1.	Principal		$1200.00
	Int. to May 18, 1905, — 1 yr.		60.00
	Amount of principal, May 18, 1905		$1260.00
	First payment	$300.00	
	Int. on $300, Oct. 15 to May 18, — 7 mo. 3 da.	8.875	
	Second payment	50.00	
	Int. on $50, Mar. 10 to May 18, — 2 mo. 8 da.	.472	
	Amount of payments, May 18, 1905		359.35
	Sum due May 18, 1905		$900.65

2. Principal		$500.00
Int. to Jan. 1, 1907, — 7 mo. 16 da.		18.83
Amount of principal, Jan. 1, 1907		$518.83
First payment	$145.00	
Int. on $145, July 10 to Jan. 1, — 5 mo. 21 da.	4.13	
Second payment	175.00	
Int. on $175, Oct. 16 to Jan. 1, — 2 mo. 15 da.	2.19	
Amount of payments, Jan. 1, 1907		326.32
Sum due Jan. 1, 1907		$192.51

3. Principal		$850.00
Int. to May 16, 1906, — 11 mo. 15 da.		48.875
Amount of principal, May 16, 1906		$898.875
First payment	$100.00	
Int. on $100, Oct. 1 to May 16, — 7 mo. 15 da.	3.75	
Second payment	150.00	
Int. on $150, Feb. 1 to May 16, — 3 mo. 15 da.	2.625	
Third payment	75.00	
Int. on $75, May 1 to May 16, — 15 da.	.19	
Amount of payments, May 16, 1906		331.565
Sum due May 16, 1906		$567.31

4. Principal		$175.00
Int. to Dec. 20, 1906, — 6 mo.		3.50
Amount of principal, Dec. 20, 1906		$178.50
First payment	$75.00	
Int. on $75, July 20 to Dec. 20, — 5 mo.	1.25	
Second payment	25.00	
Int. on $25, Aug. 15 to Dec. 20, — 4 mo. 5 da.	.35	
Amount of payments, Dec. 20, 1906		101.60
Sum due Dec. 20, 1906		$76.90

5. Principal		$1600.00
Int. to Jan. 2, 1906, — 12 mo. 1 da.		96.27
Amount of principal Jan. 2, 1906		$1696.27
First payment	$300.00	
Int. on $300, Mar. 2 to Jan. 2, — 10 mo.	15.00	
Second payment	25.00	
Int. on $25, July 1 to Jan. 2, — 6 mo. 1 da.	.75	
Third payment	80.00	
Int. on $80, Oct. 17 to Jan. 2, — 2 mo. 15 da.	1.00	
Amount of payments, Jan. 2, 1906		421.75
Sum due Jan. 2, 1906		$1274.52

Using the United States rule,

Principal, Jan 1, 1905		$1600.00
Int. to Mar. 2, 1905, — 2 mo. 1 da.		16.27
Amount		$1616.27
First payment		300.00
New principal, Mar. 2, 1905		$1316.27
Int. to July 1, 1905, — 3 mo. 29 da.		26.11
Second payment (which is less than int. due)	$25.00	
Int. from July 1 to Oct. 17, — 3 mo. 16 da. on $1316.27		23.25
Amount		$1365.63
Third payment (to be added to second)	$80.00	105.00
New principal, Oct. 17, 1905		$1260.63
Int. to Jan 2, 1906, — 2 mo. 15 da.		15.76
Amount due Jan. 2, 1906		$1276.39

Page 260

1. The amount checked out = $45 + $3.75 + $75.50 + $13.62 + $175.25 + $126.10 = $439.22;

The balance, after checking out = $846.20 − $439.22, or $406.98.

2. The total deposits = $142.34 + $112.50 + $60.40 + $18.75 + $65 + $92 = $490.99;

His balance May 1 = $490.99 − $125, or $365.99.

Page 261

3. The total deposits = $3472.38 + $84.60 + $250 + $36.22 + $80.01 + $72.35 + $39.17 + $24.64 + $7.77 + $4.65 + $96 = $4167.79;

The total sum withdrawn = $125 + $36 + $72.50 + $18.10 + $23.90 + $500 + $61.37 = $836.87;

His balance June 1 = $4167.79 − $836.87, or $3330.92.

4. The total deposits = $196.50 + $234.60 + $490.75 + $325.50 + $416 + $325 + $410.75 = $2399.10;

The first bill amounted to $1250 − 3% of $1250 = $1212.50;

The second bill amounted to $98.50 − 2% of $98.50 = $96.53;

The total sum checked out = $1212.50 + $96.53 + $375 = $1684.03;

His balance = $2399.10 − $1684.03, or $715.07.

5. The face of the check = $1850 − 5% of $1850 = $1757.50.

6. Since the amount of the check was $1757.50 [Ex. 5, ans.], the total deposit = $1757.50 + $75 + $16.63 = $1849.13.

Page 263

2. The date of maturity is 60 da. after Mar. 4, or May 3.
The term of discount is from Mar. 7 to May 3, or 57 da.
The bank discount is the interest on $5000 for 57 da. at 6%, or $47.50.
The proceeds = $5000 − $47.50 = $4952.50.

Page 264

3. The date of maturity is 30 da. after Aug. 27, or Sept. 26.
The term of discount is from Aug. 27 to Sept. 26, or 30 da.
The bank discount is the interest on $5000 for 30 da. at 6%, or $25.
The proceeds = $5000 − $25 = $4975.

4. The date of maturity is 15 da. after May 1, or May 16.
The term of discount is from May 1 to May 16, or 15 da.
The bank discount is the interest on $10,000 for 15 da. at 5%, or $20.83.
The proceeds = $10,000 − $20.83 = $9979.17.

5. The date of maturity is 90 da. after Nov. 18, or Feb. 16.
The term of discount is from Nov. 19 to Feb. 16, or 89 da.
The bank discount is the interest on $7500 for 89 da. at 6%, or $111.25.
The proceeds = $7500 − $111.25 = $7388.75.

6. The date of maturity is 10 da. after July 28, or Aug. 7.
The term of discount is from July 28 to Aug. 7, or 10 da.
The bank discount is the interest on $18,000 for 10 da. at 5%, or $25.
The proceeds = $18,000 − $25 = $17,975.

7. The date of maturity is 120 da. after Sept. 30, or Jan. 28.
The term of discount is from Sept. 30 to Jan. 28, or 120 da.
The bank discount is the interest on $3200 for 120 da. at 7%, or $74.67.
The proceeds = $3200 − $74.67 = $3125.33.

8. The date of maturity is 60 da. after Oct. 12, or Dec 11.
The term of discount is from Nov. 2 to Dec. 11, or 39 da.

Since the amount of $840 for 60 da. at 6% is $848.40, the bank discount is the interest on $848.40 for 39 da. at 6%, or $5.51.

The proceeds = $848.40 − $5.51 = $842.89.

9. The date of maturity is 30 da. after July 3, or Aug. 2.
The term of discount is from July 5 to Aug. 2, or 28 da.

Since the amount of $3000 for 30 da. at 5% is $3012.50, the bank discount is the interest on $3012.50 for 28 da. at 6%, or $14.06.

The proceeds = $3012.50 − $14.06 = $2998.44.

10. The date of maturity is 45 da. after Dec. 28, or Feb. 11.
The term of discount is from Jan. 2 to Feb. 11, or 40 da.
Since the amount of $60,000 for 45 da. at 4% is $60,300, the bank discount is the interest on $60,300 for 40 da. at 5%, or $335.
The proceeds = $60,300 – $335 = $59,965.

11. The date of maturity is 90 da. after Feb. 1, 1907, or May 2, 1907.
The term of discount is from Feb. 1 to May 2, or 90 da.
Since the amount of $8200 for 90 da. at 6% is $8323, the bank discount is the interest on $8323 for 90 da. at 7%, or $145.65.
The proceeds = $8323 – $145.65 = $8177.35.

12. The date of maturity is 60 da. after Feb. 1, 1908, or Apr. 1, 1908.
The term of discount is from Mar. 1 to Apr. 1, or 31 da.
Since the amount of $25,000 for 60 da. at 6% is $25,250, the bank discount is the interest on $25,250 for 31 da. at 4%, or $86.97.
The proceeds = $25,250 – $86.97 = $25,163.03.

13. The date of maturity is 4 mo. after Jan. 1, 1907, or May 1, 1907.
The term of discount is from Jan. 10 to May 1, or 111 da.
Since the amount of $4000 for 4 mo. at 6% is $4080, the bank discount is the interest on $4080 for 111 da. at 6%, or $75.48.
The proceeds = $4080 – $75.48 = $4004.52.

14. The date of maturity is 60 da. after Apr. 7, or June 6.
The term of discount is from Apr. 7 to June 6, or 60 da.
The bank discount is the interest on $75,000 for 60 da. at 3%, or $375.
The proceeds = $75,000 – $375 = $74,625.

15. The date of maturity is 3 mo. after July 17, or Oct. 17.
The term of discount is from Sept. 1 to Oct. 17, or 46 da.
Since the amount of $7200 for 3 mo. at 6% is $7308, the bank discount is the interest on $7308 for 46 da. at 4%, or $37.35.
The proceeds = $7308 – $37.35 = $7270.65.

16. The date of maturity is 10 da. after the day it was made.
The term of discount is for the whole period, or 10 da.
The bank discount is the interest on $1000 for 10 da. at 3½%, or $.97.
The proceeds = $1000 – $.97 = $999.03.

Page 265

17. The time the 1st note runs is from Nov. 1 to Dec. 1, or 30 da.;

The term of discount is also from Nov. 1 to Dec. 1, or 30 da.;

Since the amount of $3000 for 30 da. at 4% is $3010, the bank discount is the interest on $3010 for 30 da. at 4½%, or $11.29;

The proceeds of the 1st note = $3010 − $11.29 = $2998.71.

The time the 2d note runs is from Oct. 31 to Nov. 30, or 30 da.;

The term of discount is from Nov. 1 to Nov. 30, or 29 da.;

Since the amount of $4200 for 30 da. at 5% is $4217.50, the bank discount is the interest on $4217.50 for 29 da. at 4½%, or $15.29;

The proceeds of the 2d note = $4217.50 − $15.29 = $4202.21.

The term of discount on the 3d note is from Nov. 1 to Dec. 1, or 30 da.;

The bank discount is the interest on $5000 for 30 da. at 4½%, or $18.75;

The proceeds of the 3d note = $5000 − $18.75 = $4981.25.

The term of discount on the 4th note is from Nov. 1 to Dec. 27, or 56 da.;

The bank discount is the interest on $6400 for 56 da. at 5%, or $49.78;

The proceeds of the 4th note = $6400 − $49.78 = $6350.22.

The term of discount on the 5th note is from Nov. 1 to Nov. 9, or 8 da.;

The bank discount is the interest on $5000 for 8 da. at 4%, or $4.44;

The proceeds of the 5th note = $5000 − $4.44 = $4995.56.

The time the 6th note runs is from Oct. 31 to Nov. 15, or 15 da.;

The term of discount is from Nov. 1 to Nov. 15, or 14 da.;

Since the amount of $7500 for 15 da. at 5% is $7515.63, the bank discount is the interest on $7515.63 for 14 da. at 4%, or $11.69;

The proceeds of the 6th note = $7515.63 − $11.69 = $7503.94.

The term of discount on the 7th note is from Nov. 1 to Jan. 30, or 90 da.;

The bank discount is the interest on $12,000 for 90 da. at 6%, or $180;

The proceeds of the 7th note = $12,000 − $180 = $11,820.

The amount invested in notes is the sum of the proceeds, or $2998.71 + $4202.21 + $4981.25 + $6350.22 + $4995.56 + $7503.94 + $11,820 = $42,851.89.

18. Since $1 − $.01, or $.99, is the proceeds of $1 at 6% for 60 da., $9900 is the proceeds of as many dollars discounted for the same time and rate, as $.99 is contained times in $9900, or $10,000.

19. Since the proceeds of $1 discounted for 60 da. at 5% is $1 − $.00⅚, or $.99⅙, $2975 is the proceeds of as many dollars, discounted for the same time at the same rate, as $.99⅙ is contained times in $2975, or $3000. I must therefore draw my note for $3000.

20. Since the proceeds of $1 discounted for 90 da. at 4½% is $1 − $.01⅛, or $.98⅞, $19,775 is the proceeds of as many dollars discounted for 90 da. at 4½% as $.98⅞ is contained times in $19,775, or $20,000. To obtain $19,775, therefore, the note must be drawn for $20,000.

Page 267

1.

Date	Deposited		Drawn out		Interest		Balance	
1905								
Aug. 8	425						425	
Sept. 18			35				390	
Oct. 1							390	
Oct. 2	100						490	
1906								
Jan. 1					3	90	493	90
Mar. 19			250				243	90
Apr. 1					2	43	246	33
June 30	150						396	33
July 1					2	46	398	79
Sept. 3	80						478	79
Oct. 1					3	98	482	77
1907								
Jan. 1					4	82	487	59

2.

Date	Deposited		Drawn out		Interest		Balance	
1905								
Aug. 8	425						425	
Sept. 18			35				390	
Oct. 2	100						490	
1906								
Jan. 1							490	
Mar. 19			250				240	
June 30	150						390	
July 1					4	80	394	80
Sept. 3	80						474	80
1907								
Jan. 1					7	88	482	68

3.

DATE	DEPOSITED		DRAWN OUT		INTEREST		BALANCE	
1906								
Jan. 30	85						85	
Feb. 18	45						130	
Mar. 8	100						230	
Mar. 29	50						280	
Apr. 1							280	
Apr. 13			60				220	
June 2	125						345	
July 1					2	20	347	20
Sept. 1			80				267	20
Oct. 1					2	67	269	87
1907								
Jan. 1					2	69	272	56

4.

DATE	DEPOSITED		DRAWN OUT		INTEREST		BALANCE	
1906								
Jan. 30	85						85	
Feb. 18	45						130	
Mar. 8	100						230	
Mar. 29	50						280	
Apr. 13			60				220	
June 2	125						345	
July 1							345	
Sept. 1			80				265	
1907								
Jan. 1					3	97	268	97

5. This statement is the same as that for Ex. 4, except that the interest for Jan. 1, 1907 is $4.63, and the balance is $269.63.

6.

DATE	DEPOSITED		DRAWN OUT		INTEREST		BALANCE	
1906								
Jan. 2*	250						250	
Jan. 15	75						325	
Feb. 3	125						450	
Feb. 28			10				440	
Mar. 12	175						615	
Apr. 2			50				565	
June 4	60						625	
July 1					3	75	628	75
1907								
Jan. 1					9	42	638	17

* Consider this as Jan. 1, the bank being closed on that day.

7.

DATE	DEPOSITED		DRAWN OUT		INTEREST		BALANCE	
1906								
July 2							147	12
July 7	15	50					162	62
Sept. 12	25						187	62
Oct. 1					1	28	188	90
Oct. 2			16				172	90
Oct. 12	60						232	90
Nov. 10	22	50					255	40
Dec. 12			35				220	40
1907								
Jan. 1					1	50	221	90

8.

Date	Deposited		Drawn out		Interest		Balance	
1902								
Jan. 2*	400						400	
Mar. 6	200						600	
July 1					7		607	
Aug. 5	150						757	
1903								
Jan. 1					10	62	767	62
Jan. 2*	125						892	62
May 6	85						977	62
July 1					15	61	993	23
Oct. 1	110						1103	23
1904								
Jan. 1					17	37	1120	60
Jan. 15	75						1195	60
July 1					19	60	1215	20
Sept. 23	120						1335	20
1905								
Jan. 1					21	26	1356	46
Mar. 4	60						1416	46
July 1	50				23	73	1490	19
Dec. 2	12						1502	19
1906								
Jan. 1					26	07	1528	26
Feb. 1	44						1572	26
July 1					26	74	1599	
July 2	36						1635	
1907								
Jan. 1					28	61	1663	61

* Consider this as Jan. 1, the bank being closed on that day.

Page 273

1. The cost of the draft = $\$750 + \frac{1}{10}\%$ of $\$750 = \$750.75$.

2. The cost of the draft = $\$125,340 - \frac{1}{15}\%$ of $\$125,340 = \$125,256.44$.

3. The proceeds of the draft = $\$3500 - \frac{1}{8}\%$ of $\$3500 = \$3495.62$.

4. Since the term of discount is 30 da. + 6 da., or 36 da., the bank discount will be the interest on $2000 for 36 da. at 6%, or $12 ; $2000 – $12 = $1988, the proceeds of the draft.

6. The bank discount is the interest on $1885.50 for 60 da. at 7%, or $22.00 ;
$22.00 + $.80 = $22.80, the total charges ;
$1885.50 – $22.80 = $1862.70, the proceeds.

7. 200 × $1.80 = $360, cost of the tar ;
50 × $3.20 = $160, cost of the turpentine ;
250 × $2.05 = $512.50, cost of the resin ;
$360 + $160 + $512.50 = $1032.50, entire cost ;
$1032.50 – $275 = $757.50, face of the second draft.

8. The discount on the second draft (Ex. 7, ans.) was the interest on $757.50 for 63 da. at 6%, or $7.95 ;

The charge for exchange = 1/32% of $757.50, or $.24 ;
The total deductions = $7.95 + $.24 = $8.19 ;
The proceeds of the second draft = $757.50 – $8.19, or $749.31 ;

Since (Ex. 7) the amount of the first draft was $275, the net proceeds of the shipment = $749.31 + $275 = $1024.31.

Page 274

9. At 7½¢ per $1000, exchange on $4000 cost 4.000 × $.07½, or $.30 ;
$4000 + $.30 + $1.35 = $4001.65, the total cost.

10. 200 boxes sold for 200 × $2.50 = $500 ;
196 boxes sold for 196 × $2.40 = $470.40 ;
$500 + $470.40 = $970.40, the proceeds of the sale ;
2% of $970.40 = $19.408, or $19.41, the commission ;
396 × $.02½ = $9.90, the cost of storage ;
⅛% of $1000 = $1.25, the cost of insurance ;
$77 + $19.41 + $9.90 + $1.25 = $107.56, the entire deduction ;
$970.40 – $107.56 = $862.84, the face of the draft.

11. 75 × $13.25 = $993.75, the amount of the sale ;
$993.75 – $54.64 = $939.11, the face of the draft ;

Since the discount per $1000 was $.30, the discount on $939.11 was .93911 × $.30 = $.281733, or $.28 ;

$939.11 – $.28 = $938.83, the net proceeds.

12. 800 × $3.25 = $2600, the cost of the flour ; also the face of the draft ;
The discount was the interest on $2600 for 66 da. at 6%, or $28.60 ;
The charge for exchange = 2.600 × $.15 = $.39 ;
$28.60 + $.39 = $28.99, the entire deduction ;
$2600 – $28.99 = $2571.01, the net proceeds.

13. The cost of transferring \$3,142,000 to New Orleans and the South = 3142.000 × \$.75 = \$2356.50;

The cost of transferring \$7,495,000 + \$3,280,000, or \$10,775,000, to St. Louis, Chicago, and the West = 10,775.000 × \$.50 = \$5387.50;

The cost of transferring \$3,746,000 to near-by Eastern cities = 3746.000 × \$.25 = \$936.50;

\$2356.50 + \$5387.50 + \$936.50 = \$8680.50, the total cost.

Page 277

1. Since $5.16\frac{7}{8}$ fr. cost \$1, 265 fr. cost as many dollars as $5.16\frac{7}{8}$ is contained times in 265, or \$51.27⁻.

2. Since 4 M. cost $\$.94\frac{1}{2}$, 1 M. costs $\frac{1}{4}$ of $\$.94\frac{1}{2}$, or $\$.236\frac{1}{4}$, and 250 M. cost 250 × $\$.236\frac{1}{4}$, or \$59.06+.

3.

$$\begin{array}{r|l} & \pounds\ s.\ d. \\ & 75\ 6\ 4 \\ 12 & \quad\ \ 4 \\ \hline 20 & \ \ 6.333+ \\ \hline & 75.3167- \end{array}$$

Since £1 costs $\$4.85\frac{1}{4}$, £75 6*s.* 4*d.*, or £75.3167, cost 75.3167 × $\$4.85\frac{1}{4}$, or \$365.47+.

4. Since £1 costs \$4.8365, £1200 cost 1200 × \$4.8365, or \$5803.80.

5. Since £1 costs \$4.8420, £1525 cost 1525 × \$4.8420, or \$7384.05.

6.

$$\begin{array}{r|l} & \pounds\quad s. \\ & 95\quad 12 \\ 20 & \quad\ \ 12 \\ \hline & 95\quad .6 \end{array}$$

Since £1 costs $\$4.87\frac{1}{4}$, £95 12*s.*, or £95.6, cost 95.6 × $\$4.87\frac{1}{4}$, or \$465.81.

7.

$$\begin{array}{r|l} & \pounds\quad s.\quad d. \\ & 225\ 10\ \ 2 \\ 12 & \qquad\quad\ 2 \\ \hline 20 & \quad\ 10.17- \\ \hline & 225\ .508+ \end{array}$$

Since £1 costs $\$4.83\frac{5}{8}$, £225 10*s.* 2*d.*, or £225.508, cost 225.508 × $\$4.83\frac{5}{8}$, or \$1090.61.

8. Since 5.18 fr. cost \$1, 10,000 fr. cost as many dollars as 5.18 is contained times in 10,000, or \$1930.50.

9. Since 4 M. cost $\$.95\frac{1}{16}$, 1 M. costs $\frac{1}{4}$ of $\$.95\frac{1}{16}$, or $\$.23\frac{49}{64}$, and 25,000 M. cost 25,000 × $\$.23\frac{49}{64}$, or \$5941.41.

10. Since $5.19\frac{7}{8}$ fr. cost \$1, 1224.75 fr. cost as many dollars as $5.19\frac{7}{8}$ is contained times in 1224.75, or \$235.59.

11. Since 4 M. cost $\$.94\frac{3}{4}$, 1 M. costs $\frac{1}{4}$ of $\$.94\frac{3}{4}$, or $\$.23\frac{11}{16}$, and 4520.65 M. cost 4520.65 × $\$.23\frac{11}{16}$, or \$1070.83.

12. Since the price of £1 was $4.83⅞, the amount received for £1075 was 1075 × $4.83⅞, or $5201.66, the proceeds.

13. Since 5.19 lire cost $1, 2000 lire cost as many dollars as 5.19 is contained times in 2000, or $385.36.

14. Since £1 cost $4.87, £5 cost 5 × $4.87, or $24.35;
$24.35 + $.30 = $24.65, the entire cost.

15. The whole cost = $4000 + ½% of $4000 = $4020.

16. The number of 20-dollar checks cashed in England = $700 ÷ $20, or 35 checks; since each check was worth £4 1*s.* 2*d.*, the amount of English money received = 35 × £4 1*s.* 2*d.*, or £142 10*d.*

The number of 20-dollar checks cashed in France = $900 ÷ $20, or 45 checks; since each check was worth 102.50 fr., the amount of French money received = 45 × 102.50 fr., or 4612.50 fr.

The number of 20-dollar checks cashed in Germany = $400 ÷ $20, or 20 checks; since each check was worth 82.50 M., the amount of German money received = 20 × 82.50 M., or 1650 M.

The number of 20-dollar checks cashed in Denmark = $200 ÷ $20, or 10 checks; since each check was worth 73.39 crowns, the amount of Danish money received = 10 × 73.39 crowns, or 733.9 crowns.

The number of 20-dollar checks cashed in Belgium = $500 ÷ $20, or 25 checks; since each check was worth 102.50 fr., the amount of Belgian money received = 25 × 102.50 fr., or 2562.50 fr.

The number of 20-dollar checks cashed in Holland = $200 ÷ $20, or 10 checks; since each check was worth 49.02 florins, the amount of Dutch money received = 10 × 49.02 florins, or 490.2 florins.

The number of 20-dollar checks cashed in Italy = $600 ÷ $20, or 30 checks; since each check was worth 102.50 lire, the amount of Italian money received = 30 × 102.50 lire, or 3075 lire.

The total amount cashed = $700 + $900 + $400 + $200 + $500 + $200 + $600 = $3500; since the owner had purchased checks to the value of $4000, the amount refunded = $4000 − $3500, or $500.

Page 278

17. Since £1 cost $4.86½, £15,000 cost 15,000 × $4.86½, or $72,975.

18. The cost of £1 of draft would have been $4.8640; of £15,000 of draft, 15,000 × $4.8640, or $72,960; also, at $5 per £10,000 the brokerage on £15,000 = 1½ × $5, or $7.50; hence, the total cost would have been $72,960 + $7.50 = $72,967.50. Since the actual cost was $72,975 (Ex. 17, ans.), the cost through a broker would have been $72,975 − $72,967.50, or $7.50, less.

19. Since 4 M. = \$.94½, 1 M. = ¼ of \$.94½, or \$.23⅝, and 25,600 M. = 25,600 × \$.23⅝, or \$6048;
$\frac{1}{64}$% of \$6048 = \$.94½, or \$.95, the brokerage;
\$6048 − \$.95 = \$6047.05, the proceeds.

20. Since £1 of draft cost \$4.83⅞, £25,000 cost 25,000 × \$4.83⅞, or \$120,968.75; also, at \$5 per £10,000, the brokerage on £25,000 = 2.5 × \$5, or \$12.50; hence, the proceeds = \$120,968.75 − \$12.50, or \$120,956.25.

21. 100,000 × \$4.81½ = \$481,500, the cost to the N. Y. bank;
£100,000 − ½% of £100,000 = £99,500, N. Y. bank's proceeds in London;
99,500 × \$4.85⅞ = \$483,445.62½, receipts from sale of proceeds;
\$483,445.63 − \$481,500 = \$1945.63, the profit.

22. The sum invested = 10,000 × \$4.80 = \$48,000;
The interest on \$48,000 for 60 da. at 5% = \$400.

23. From Ex. 22 he gained \$4.87 − \$4.80, or \$.07, on £1;
On £10,000 he gained 10,000 × \$.07, or \$700.

24. The amount of the sale = 22,500 × \$1.60, or \$36,000; since the equivalent of \$1 was 5.20¼ fr., the equivalent of \$36,000 was 36,000 × 5.20¼ fr., or 187,290 fr., the face of the bill.

Page 283

2. The brokerage per share = ⅛% of \$100 = \$⅛;
The total cost per share = \$174⅝ + \$⅛ = \$174¾;
Then the cost of 25 shares = 25 × \$174¾ = \$4368.75.

3. The total cost per bond = 102¾% + ⅛%, or 102⅞%, of \$1000 = \$1028.75;
The cost of 25 bonds = 25 × \$1028.75 = \$25,718.75.

4. The total cost per share = \$106⅜ + \$⅛ = \$106½;
The cost of 100 shares = 100 × \$106½ = \$10,650.

5. The total cost of one share = \$192⅜ + \$⅛ = \$192½;
The cost of 200 shares = 200 × \$192½ = \$38,500.

6. The total cost per share = \$137½ + \$⅛ = \$137⅝;
The cost of 500 shares = 500 × \$137⅝ = \$68,812.50.

7. The total cost per share = 127¾% + ¼%, or 128%, of \$50 = \$64;
The cost of 500 shares = 500 × \$64 = \$32,000.

8. He paid for each share \$93½ + \$⅛, or \$93⅝;
He received for each share \$95⅞ − \$⅛, or \$95¾;
His net gain per share = \$95¾ − \$93⅝ = \$2⅛;
His net gain on 100 shares = 100 × \$2⅛ = \$212.50.

9. For buying and selling one share the broker received $\$\frac{1}{8} + \$\frac{1}{8}$, or $\$\frac{1}{4}$;
For 500 shares he received $500 \times \$\frac{1}{4}$, or $125.
The advance in the price per share $= \$68\frac{1}{4} - \$67\frac{1}{2}$, or $\$\frac{3}{4}$;
Deducting brokerage, the net gain per share $= \$\frac{3}{4} - \$\frac{1}{4}$, or $\$\frac{1}{2}$;
The net gain on 500 shares $= 500 \times \$\frac{1}{2} = \$250$.

10. Each share of General Electric stock realized $\$166\frac{1}{2} - \$\frac{1}{8}$, or $\$166\frac{3}{8}$;
200 shares realized $200 \times \$166\frac{3}{8}$, or $33,275;
The broker had on hand $33,275 + $7000, or $40,275;
Each share of Ill. Central stock cost $\$170 + \$\frac{1}{8}$, or $\$170\frac{1}{8}$;
400 shares cost $400 \times \$170\frac{1}{8}$, or $68,050;
He needed $68,050 – $40,275, or $27,775, the face of the draft.

Page 284

12. The total cost per share $= \$97\frac{1}{8} + \$\frac{1}{8} = \$97\frac{1}{4}$;
The number of shares = $4862.50 ÷ $97.25, or 50 shares.

13. The total cost per share $= \$100 + \$\frac{1}{8} = \$100\frac{1}{8}$;
The number of shares $= \$8010 \div \$100\frac{1}{8}$, or 80 shares.

14. The total cost per share $= \$92\frac{3}{4} + \$\frac{1}{8} = \$92\frac{7}{8}$;
The number of shares = $40,865 ÷ $92.875, or 440 shares.

16. The cost of 1 share $= \$149\frac{1}{4} + \$\frac{1}{8} = \$149\frac{3}{8}$;
The cost of 125 shares $= 125 \times \$149\frac{3}{8}$, or $18,671.88;
The sum received for 1 share $= \$152\frac{1}{2} - \$\frac{1}{8} = \$152\frac{3}{8}$;
The sum received for 125 shares $= 125 \times \$152\frac{3}{8}$, or $19,046.88;
The dividend on 125 100-dollar shares $= 1\frac{1}{4}\%$ of $12,500 = $156.25;
The total amount received = $19,046.88 + $156.25 = $19,203.13;
The gain = $19,203.13 – $18,671.88 = $531.25.

17. The total cost per share of stock $= \$125 + \$\frac{1}{8}$, or $\$125\frac{1}{8}$;
The number of shares $= \$2002 \div \$125\frac{1}{8}$, or 16 shares;
The dividend on 16 100-dollar shares $= 2\frac{1}{2}\%$ of $1600 = $40;
The interest on $2002 for 6 mo. at $3\frac{1}{2}\%$ was $\$35.03\frac{1}{2}$;
Hence, my semiannual income was increased $\$40 - \$35.03\frac{1}{2}$, or $\$4.96\frac{1}{2}$.

Page 285

18. The total cost of 1 share $= \$87\frac{1}{2} + \$\frac{1}{8} = \$87\frac{5}{8}$;
The total cost of 300 shares $= 300 \times \$87\frac{5}{8} = \$26,287.50$;
The sum received for 1 share $= \$81\frac{7}{8} - \$\frac{1}{8} = \$81\frac{3}{4}$;
The sum received for 315 shares $= 315 \times \$81\frac{3}{4} = \$25,751.25$;
His loss = $26,287.50 – $25,751.25 = $536.25.

20. Since the income from each \$100, par value, is \$6, the par value of the bonds purchased to give an annual income of \$2400 must be as many times \$100 as \$6 is contained times in \$2400, that is, 400 × \$100, or \$40,000.

At $99\frac{5}{8}$, the cost, including brokerage, will be $99\frac{5}{8}\% + \frac{1}{8}\%$, or $99\frac{3}{4}\%$, of the par value. Therefore $99\frac{3}{4}\%$ of \$40,000, or \$39,900, must be invested to secure an annual income of \$2400.

21. Since the income from each \$100, par value, is \$5, the par value of the bonds purchased to give an annual income of \$500 must be as many times \$100 as \$5 is contained times in \$500, that is, 100 × \$100, or \$10,000.

At $105\frac{3}{8}$, the cost, including brokerage, will be $105\frac{3}{8}\% + \frac{1}{8}\%$, or $105\frac{1}{2}\%$, of the par value. Therefore $105\frac{1}{2}\%$ of \$10,000, or \$10,550, must be invested to secure an annual income of \$500.

22. Since the income from each \$100, par value, is \$6, the par value of the bonds purchased to give an annual income of \$1200 must be as many times \$100 as \$6 is contained times in \$1200, that is, 200 × \$100, or \$20,000.

At $99\frac{7}{8}$, the cost, including brokerage, will be $99\frac{7}{8}\% + \frac{1}{8}\%$, or 100%, of the par value. Therefore \$20,000 must be invested to yield \$1200.

23. Each 100 dollars' worth of bonds costs \$80 and yields 4% of \$100, or \$4, interest; $\$4 \div \$80 = .05$; that is, the interest is 5% of the sum invested.

24. Each 100-dollar share costs \$75 and yields 6% of \$100, or \$6, interest; $\$6 \div \$75 = .08$; that is, the interest is 8% of the money invested.

25. The interest on each share = 4% of \$100, or \$4; since \$4 is to be 5% of the price per share, I must pay $\$4 \div .05$, or \$80, per share.

26. The interest on each share = 6% of \$100, or \$6; since \$6 is to be 5% of the price per share, the sum paid = $\$6 \div .05$, or \$120, per share.

Page 286

27. The interest on each share = 3% of \$100, or \$3; since \$3 is to be 8% of the price per share, the sum paid per share = $\$3 \div .08$, or $\$37\frac{1}{2}$.

28. The dividend per share = $\$50 \div 25$, or \$2;
The rate of dividend = $\$2 \div \$100 = .02$, or 2%.

29. The rate of dividend = $\$6000 \div \$300{,}000 = .02$, or 2%;
The dividend on 40 100-dollar shares = 2% of \$4000, or \$80.

30. The total amount of dividend = $\$65{,}835 - \$5835 = \$60{,}000$;
The rate of dividend = $\$60{,}000 \div \$360{,}000 = \frac{1}{6}$, or $16\frac{2}{3}\%$;
The dividend on 60 shares = $16\frac{2}{3}\%$ of \$6000, or \$1000.

31. The total cost per share = $\$115 + \$\frac{1}{8} = \$115.125$;
The number of shares = $\$4835.25 \div \$115.125$, or 42 shares;
The income from 42 100-dollar shares = 6% of \$4200, or \$252.

32. The selling price, less brokerage = $\$191\frac{1}{2} - \$\frac{1}{8} = \$191\frac{3}{8}$;
His loss per share = $\$193 - \$191\frac{3}{8} = \$1\frac{5}{8}$;
His loss on 50 shares = $50 \times \$1\frac{5}{8}$, or $81.25.

33. Since the income from each $100, par value, is $4, the par value of the bonds purchased to give an annual income of $1000 must be as many times $100 as $4 is contained times in $1000, that is, 250 × $100, or $25,000.

At $133\frac{1}{2}$, the cost, including brokerage, will be $133\frac{1}{2}\% + \frac{1}{8}\%$, or $133\frac{5}{8}\%$ of the par value. Therefore $133\frac{5}{8}\%$ of $25,000, or $33,406.25, must be invested to obtain an annual income of $1000.

34. Each 100 dollars' worth of bonds sold at $\$93\frac{1}{2}$ and yielded 6% of $100, or $6, interest; $\$6 \div \$93.50 = .0642^{-}$; that is, the interest was 6.42% of the sum invested.

35. Each $100 in bonds, par value, sold for $\$103\frac{3}{8}$, and yielded 5% of $100, or $5, interest; $\$5 \div \$103\frac{3}{8} = .04\frac{692}{827}$; that is, the interest paid was $4\frac{692}{827}\%$ of the money invested.

36. At 7% per year, or $1\frac{3}{4}\%$ per quarter, preferred stock received a total dividend of $1\frac{3}{4}\%$ of $12,500,000, or $218,750, and common stock, a dividend of $375,000 − $218,750, or $156,250; $\$156,250 \div \$12,500,000 = .01\frac{1}{4}$; that is, the dividend on common stock was $1\frac{1}{4}\%$;
The dividend on 50 shares of preferred stock = $50 \times \$1\frac{3}{4} = \$87\frac{1}{2}$;
The dividend on 10 shares of common stock = $10 \times \$1\frac{1}{4} = \$12\frac{1}{2}$;
The stockholder's dividend = $\$87\frac{1}{2} + \$12\frac{1}{2}$, or $100.

Page 288

1. $\frac{4}{5} : \frac{2}{5} = \frac{4}{5} \div \frac{2}{5} = 2.$

2. $\frac{3}{4} : \frac{1}{2} = \frac{3}{4} \div \frac{1}{2} = 1\frac{1}{2}.$

3. $\frac{5}{8} : \frac{1}{4} = \frac{5}{8} \div \frac{1}{4} = 2\frac{1}{2}.$

4. $.7 : .8 = \frac{.7}{.8} = \frac{7}{8}.$

5. $.4 : 10 = \frac{.4}{10} = \frac{4}{100} = \frac{1}{25}.$

6. $7.5 : 12 = \frac{7.5}{12} = \frac{75}{120} = \frac{5}{8}.$

7. $10 : 4.5 = \frac{10}{4.5} = \frac{100}{45} = 2\frac{2}{9}.$

8. $72 : 8.5 = 72 \div 8.5 = 8\frac{8}{17}.$

9. $2\frac{1}{2} : 7\frac{1}{2} = 2\frac{1}{2} \div 7\frac{1}{2} = \frac{1}{3}.$

10. 4 ft. : 16 in. = 4 ft. : $1\frac{1}{3}$ ft. = $4 \div 1\frac{1}{3} = 3.$

11. 2 yd. : 18 in. = 2 yd. : $\frac{1}{2}$ yd. = $2 \div \frac{1}{2} = 4.$

12. 1 Km. : 62.5 m. = 1000 m. : 62.5 m. = $1000 \div 62.5 = 16.$

13. The ratio of gross earnings to capital stock = $\frac{\$1,500,000}{\$7,500,000} = \frac{1}{5} = 1:5.$

The ratio of net earnings to gross earnings = $\frac{\$600,000}{\$1,500,000} = \frac{2}{5} = 2:5.$

The ratio of net earnings to capital stock = $\frac{\$600,000}{\$7,500,000} = \frac{2}{25} = 2:25.$

$\frac{1}{5} = 20\%$; $\frac{2}{5} = 40\%$; $\frac{2}{25} = 8\%$.

Page 289

14. Since 17% of 10,000 = 1700, the ratio of the illiterate to the entire population in 1880 was 1700 : 10,000.

Since 13.3% of 10,000 = 1330, the ratio of the illiterate to the entire population in 1890 was 1330 : 10,000.

Since 10.7% of 10,000 = 1070, the ratio of the illiterate to the entire population in 1900 was 1070 : 10,000.

Page 290

3. Reducing 30 : 5 to lowest terms, $6 : 1 = 12 : x$;

Product of extremes = product of means

$$6x = 12$$
$$x = 2$$

4. Reducing 10 : 5 to lowest terms, $2 : 1 = x : 7$;

Product of means = product of extremes

$$x = 2 \times 7 = 14$$

5. Reducing 3 : 6 to lowest terms, $15 : x = 1 : 2$;

Product of means = product of extremes

$$x = 15 \times 2 = 30$$

6. Reducing 6 : 2 to lowest terms, $15 : x = 3 : 1$;

Product of means = product of extremes

$$3x = 15$$
$$x = 5$$

7. Reducing 10 : 2 to lowest terms, $15 : x = 5 : 1$;

Product of means = product of extremes

$$5x = 15$$
$$x = 3$$

8. Reducing 5 : 20 to lowest terms, $1 : 4 = x : 32$;

Product of means = product of extremes

$$4x = 32$$
$$x = 8$$

9. Product of means = product of extremes

$$\tfrac{3}{4}x = \tfrac{1}{2}$$
$$\tfrac{1}{4}x = \tfrac{1}{6}$$
$$x = \tfrac{2}{3}$$

10. Product of extremes = product of means

$$\tfrac{1}{4}x = \tfrac{2}{3} \times \tfrac{1}{2} = \tfrac{1}{3}$$
$$x = 1\tfrac{1}{3}$$

11. Product of extremes = product of means

$$2x = \tfrac{3}{2}$$
$$x = \tfrac{3}{4}$$

12. Product of means = product of extremes

$$\tfrac{3}{16}x = \tfrac{7}{8} \times \tfrac{5}{8} = \tfrac{35}{64}$$
$$\tfrac{1}{16}x = \tfrac{1}{3} \text{ of } \tfrac{35}{64}$$
$$x = \tfrac{16}{3} \text{ of } \tfrac{35}{64} = 2\tfrac{11}{12}$$

13. Reducing $50:75$ to lowest terms, $2:3 = x:3$;

Product of means = product of extremes

$$3x = 2 \times 3$$
$$x = 2 \times 1 = 2$$

14. Reducing $24:72$ to lowest terms, $1:3 = 3:x$;

Product of extremes = product of means

$$x = 3 \times 3 = 9$$

15. Reducing $15:40$ to lowest terms, $3:x = 3:8$

Product of means = product of extremes

$$3x = 3 \times 8$$
$$x = 1 \times 8 = 8, \text{ the number of tons}$$

16. Since $\frac{18 \text{ yd.}}{24 \text{ yd.}} = \frac{18}{24}$ and $\frac{\$x}{\$3.60} = \frac{x}{3.60}$, the number of dollars may be found from the proportion $\frac{18}{24} = \frac{x}{3.60}$, or $18:24 = x:3.60$;

Reducing $18:24$ to lowest terms, $3:4 = x:3.60$;

Product of means = product of extremes

$$4x = 3 \times 3.60$$
$$x = 3 \times .90 = 2.70, \text{ the number of dollars}$$

17. Since $\frac{15 \text{ bu.}}{x \text{ bu.}} = \frac{15}{x}$ and $\frac{\$37.50}{\$100} = \frac{37.50}{100}$, the number of bushels may be found from the proportion $\frac{15}{x} = \frac{37.50}{100}$, or $15:x = 37.5:100$;

Reducing $37.5:100$ to lowest terms, $15:x = 3:8$;

Product of means = product of extremes

$$3x = 15 \times 8$$
$$x = 5 \times 8 = 40, \text{ the number of bushels}$$

18. Since $\frac{4 \text{ men}}{12 \text{ men}} = \frac{4}{12}$ and $\frac{5 \text{ days}}{x \text{ days}} = \frac{5}{x}$, the number of days may be found from the proportion $\frac{4}{12} = \frac{5}{x}$, or $4:12 = 5:x$;

Reducing $4:12$ to lowest terms, $1:3 = 5:x$;

Product of extremes = product of means

$$x = 3 \times 5 = 15, \text{ the number of days}$$

19. Since $\frac{x \text{ ft.}}{5600 \text{ ft.}} = \frac{x}{5600}$, the number of feet may be found from the proportion $\frac{x}{5600} = \frac{4}{1120}$, or $x : 5600 = 4 : 1120$;

Reducing $4 : 1120$ to lowest terms, $x : 5600 = 1 : 280$;

Product of extremes = product of means

$$280x = 5600$$

$$x = 20, \text{ the number of feet}$$

Page 291

2. The cost was proportional to the number of acres; that is,

Cost of 30 A. : cost of 180 A. : : 30 A. : 180 A.

Or, $\$x : \$11{,}000 = 30 \text{ A.} : 180 \text{ A.}$

Hence, $x : 11{,}000 = 30 : 180$

Reducing the 2d ratio, $x : 11{,}000 = 1 : 6$

$$6x = 11{,}000$$

$$x = 1833.33\tfrac{1}{3}$$

Hence, for 30 A. he received $1833.34.

3. The yield is proportional to the acreage; that is,

Yield of 132 A. : yield of 55 A. : : 132 A. : 55 A.

Or, $x \text{ bu.} : 1430 \text{ bu.} = 132 \text{ A.} : 55 \text{ A.}$

Hence, $x : 1430 = 132 : 55$

Reducing the 2d ratio, $x : 1430 = 12 : 5$

$$5x = 1430 \times 12$$

$$x = 286 \times 12 = 3432$$

Hence, 132 A. will yield 3432 bu.

4. The time is proportional to the distance; that is,

Time to travel 3.3 Km. : time to travel 825 m. : : 3.3 Km. : 825 m.

Or, $x \text{ sec.} : 2\tfrac{1}{2} \text{ sec.} = 3300 \text{ m.} : 825 \text{ m.}$

Hence, $x : 2\tfrac{1}{2} = 3300 : 825$

Reducing the 2d ratio, $x : 2\tfrac{1}{2} = 4 : 1$

$$x = 2\tfrac{1}{2} \times 4 = 10$$

Hence, the report of a cannon will travel 3.3 Km. in 10 sec.

5. The cost is proportional to the quantity; that is,

Cost of 5 lb. : cost of 24 lb. : : 5 lb. : 24 lb.

Or, $\$x : \$3.60 = 5 \text{ lb.} : 24 \text{ lb.}$

Hence, $x : 3.60 = 5 : 24$

$$24x = 3.60 \times 5$$

$$x = .15 \times 5 = .75$$

Hence, for 5 lb. of maple sugar $.75 must be paid.

6. The time was proportional to the distance; that is,

Time for 136.5 mi. : time for 52.5 mi. : : 136.5 mi. : 52.5 mi.

Or, x hr. : 2 hr. = 136.5 mi. : 52.5 mi.

Hence, $x : 2 = 136.5 : 52.5$

Reducing the 2d ratio, $x : 2 = 27.3 : 10.5$

$$10.5\,x = 27.3 \times 2 = 54.6$$
$$x = 54.6 \div 10.5 = 5.2$$

Hence, it took 5.2 hr., or 5 hr. 12 min., to complete the course.

7. The cost is proportional to the area; that is,

Cost for $15\frac{1}{2}$ sq. yd. : cost for $8\frac{1}{4}$ sq. yd. : : $15\frac{1}{2}$ sq. yd. : $8\frac{1}{4}$ sq. yd.

Or, x¢ : 66¢ = $15\frac{1}{2}$ sq. yd. : $8\frac{1}{4}$ sq. yd.

Hence, $x : 66 = 15\frac{1}{2} : 8\frac{1}{4}$

$$8\tfrac{1}{4}\,x = 66 \times 15\tfrac{1}{2}$$
$$x = 8 \times 15\tfrac{1}{2} = 124$$

Hence, the cost for $15\frac{1}{2}$ sq. yd. is $1.24.

8. The number of blocks is proportional to the number of days; that is,

Number of blocks in 20 da. : number of blocks in 6 da. : : 20 da. : 6 da.

Or, x blocks : 7500 blocks = 20 da. : 6 da.

Hence, $x : 7500 = 20 : 6$

$$6\,x = 7500 \times 20$$
$$x = 1250 \times 20 = 25{,}000$$

Hence, the plant can make 25,000 blocks in 20 da.

9. The number of photographs was proportional to the time; that is,

Number in 7 min. : number in $33\frac{1}{3}$ sec. : : 7 min. : $33\frac{1}{3}$ sec.

Or, x photographs : 500 photographs = 7 min. : $\frac{5}{9}$ min.

Hence, $x : 500 = 7 : \frac{5}{9}$

$$\tfrac{5}{9}\,x = 500 \times 7 = 3500$$
$$\tfrac{1}{9}\,x = \tfrac{1}{5} \text{ of } 3500 = 700$$
$$x = 6300$$

Hence, there were 6300 photographs in the series.

Page 292

11. Let x represent the number of days it will take 20 men. Since 20 men can do the work in less than 15 da., the ratio x da. : 15 da. is less than 1. The corresponding ratio between 20 men and 16 men is 16 men : 20 men.

Therefore, x da. : 15 da. = 16 men : 20 men

$$x : 15 = 16 : 20$$
$$x : 15 = 4 : 5$$
$$5\,x = 60$$
$$x = 12$$

Hence, 20 men can do the work in 12 da.

12. Let x represent the number of men required to do the work in 10 da.

Since it will take more than 16 men to do the work in 10 da., the ratio x men : 16 men is more than 1. The corresponding ratio between 10 da. and 15 da. is 15 da. : 10 da.

Therefore, x men : 16 men = 15 da. : 10 da.

$$x : 16 = 15 : 10$$
$$x : 16 = 3 : 2$$
$$2x = 16 \times 3$$
$$x = 8 \times 3 = 24$$

Hence, it will require 24 men to do the work in 10 da.

13. Let x represent the number of days of 10 hr. each. Since it will take the men less than 20 da., working 10 hr. per day, the ratio x da. : 20 da. is less than 1. The corresponding ratio between 10 hr. and 8 hr. is 8 hr. : 10 hr.

Therefore, x da. : 20 da. = 8 hr. : 10 hr.

$$x : 20 = 8 : 10$$
$$10x = 160$$
$$x = 16$$

Hence, by working 10 hr. a day they can do the work in 16 da.

14. Let x represent the number of men needed to do the work in 16 da.

Since it will take more than 24 men to do the work in 16 da., the ratio x men : 24 men is greater than 1. The corresponding ratio between 16 da. and 18 da. is 18 da. : 16 da.

Therefore, x men : 24 men = 18 da. : 16 da.

$$x : 24 = 18 : 16$$
$$16x = 24 \times 18$$
$$x = 3 \times 9 = 27$$

Hence, since 27 men are required, 3 extra men must be employed.

15. Let x represent the number of men necessary to do the work in 75 da.

Since it will take less than 40 men to do the work in 75 da., the ratio x men : 40 men is less than 1. The corresponding ratio between 75 da. and 60 da. is 60 da. : 75 da.

Therefore, x men : 40 men = 60 da. : 75 da.

$$x : 40 = 60 : 75$$
$$x : 40 = 4 : 5$$
$$5x = 40 \times 4$$
$$x = 8 \times 4 = 32$$

Hence, since 32 men can do the work, 8 men may be discharged.

16. Int. for 8 mo. : int. for 6 mo. : : 8 mo. : 6 mo.

Or,

$$\begin{aligned} \$x : \$33 &= 8 \text{ mo.} : 6 \text{ mo.} \\ x : 33 &= 8 : 6 \\ x : 33 &= 4 : 3 \\ 3x &= 33 \times 4 \\ x &= 11 \times 4 = 44 \end{aligned}$$

Hence, the interest for 8 mo. is $44.

17. Miles per hour : miles in 5 min. 15 sec. : : 1 hr. : 5 min. 15 sec.

Or,

$$\begin{aligned} x \text{ mi.} : 5 \text{ mi.} &= 60 \text{ min.} : 5\tfrac{1}{4} \text{ min.} \\ x : 5 &= 60 : \tfrac{21}{4} \\ x : 5 &= 20 : \tfrac{7}{4} \\ \tfrac{7}{4}x &= 5 \times 20 = 100 \\ x &= \tfrac{400}{7} = 57\tfrac{1}{7} \end{aligned}$$

Hence, the train was moving $57\frac{1}{7}$ mi. per hour.

Page 293

18. Number broken out of every 3 doz. : total number broken : : 3 doz : 450 doz.

Or,

$$\begin{aligned} 5 \text{ eggs} : x \text{ eggs} &= 3 \text{ doz.} : 450 \text{ doz.} \\ 5 : x &= 3 : 450 \\ 5 : x &= 1 : 150 \\ x &= 5 \times 150 = 750 = 62\tfrac{1}{2} \text{ doz.} \end{aligned}$$

Hence, since $62\frac{1}{2}$ doz. eggs were broken, 450 doz. – $62\frac{1}{2}$ doz., or $387\frac{1}{2}$ doz., were left unbroken.

19. B's assessment : A's assessment : : B's tax : A's tax

Or,

$$\begin{aligned} \$x : \$12{,}000 &= \$157.50 : \$225 \\ x : 12{,}000 &= 157.50 : 225 \\ x : 12{,}000 &= .70 : 1 \\ x &= 12{,}000 \times .70 = 8400 \end{aligned}$$

Hence, B's house was assessed for $8400.

20. My tax : total tax : : valuation of my property : total valuation

Or,

$$\begin{aligned} \$x : \$102{,}300 &= \$23{,}250 : \$4{,}650{,}000 \\ x : 102{,}300 &= 23{,}250 : 4{,}650{,}000 \\ 4{,}650{,}000x &= 102{,}300 \times 23{,}250 = 2{,}378{,}475{,}000 \\ x &= 511.50 \end{aligned}$$

Hence, I must pay a tax of $511.50.

21. Let x represent the number of weeks the flour would last 210 soldiers.

Since the flour would last 210 soldiers less than 9 wk., the ratio x wk. : 9 wk. is less than 1. The corresponding ratio between 210 soldiers and 150 soldiers is 150 soldiers : 210 soldiers.

Therefore, x wk. : 9 wk. = 150 soldiers : 210 soldiers

$$x : 9 = 150 : 210$$
$$x : 9 = 5 : 7$$
$$7x = 9 \times 5 = 45$$
$$x = \frac{45}{7}$$

Hence, the flour would last 210 soldiers $\frac{45}{7}$ wk., or 45 da.

22. Let x represent the number of cars needed to carry 5175 bbl.

Then, x cars : 18 cars : : 5175 bbl. : 4050 bbl.

$$x : 18 = 5175 : 4050$$
$$x : 18 = 23 : 18$$
$$18x = 18 \times 23$$
$$x = 23$$

Hence, since 23 cars are needed for 5175 bbl., 5 cars must be added.

Page 294

2. Let $3x$, $4x$, and $5x$ represent the number of dollars in each part, respectively.

Then,
$$3x + 4x + 5x = 24{,}000$$
$$12x = 24{,}000$$
$$x = 2000$$

Hence, $3x = 6000$, $4x = 8000$, and $5x = 10{,}000$.

Therefore the parts are \$6000, \$8000, and \$10,000, respectively.

3. Let $3x$, $5x$, and $10x$ represent the number of dollars in each part, respectively.

Then,
$$3x + 5x + 10x = 36{,}000$$
$$18x = 36{,}000$$
$$x = 2000$$

Hence, $3x = 6000$, $5x = 10{,}000$, and $10x = 20{,}000$.

Therefore the parts are \$6000, \$10,000, and \$20,000, respectively.

4. Let $13x$ represent the number of dollars expenses and $2x$ the number of dollars net earnings.

Then,
$$13x + 2x = 16{,}725{,}000$$
$$15x = 16{,}725{,}000$$
$$x = 1{,}115{,}000$$

Hence, $13x = 14{,}495{,}000$ and $2x = 2{,}230{,}000$.

Therefore the expenses were \$14,495,000 ; the net earnings, \$2,230,000.

5. Let $6x$, $3x$, x, $\frac{1}{5}x$, and $\frac{1}{5}x$ represent the number of grams of bread, of meat, of rice, of salt, and of coffee, respectively.

Then,
$$6x + 3x + x + \tfrac{1}{5}x + \tfrac{1}{5}x = 1300$$
$$10\tfrac{2}{5}x = 1300$$
$$x = 125$$

Hence, $6x = 750$, $3x = 375$, and $\frac{1}{5}x = 25$.

Therefore the bread weighs 750 g., the meat, 375 g., the rice, 125 g., the salt, 25 g., and the coffee, 25 g.

6. Let $400x$ and $500x$ represent the number of dollars apportioned to each road, respectively.

Then,
$$400x + 500x = 2160$$
$$900x = 2160$$
$$x = 2.4$$

Hence, $400x = 960$ and $500x = 1200$.

Therefore the respective earnings were $960 and $1200.

7. Let $8x$, $4x$, and x represent the number of dollars in each kind of earnings, respectively.

Then,
$$8x + 4x + x = 78{,}000{,}000$$
$$13x = 78{,}000{,}000$$
$$x = 6{,}000{,}000$$

Hence, $8x = 48{,}000{,}000$ and $4x = 24{,}000{,}000$.

Therefore the earnings, in order, are $48,000,000, $24,000,000, and $6,000,000.

8. Let $30x$, $15x$, $24x$, $18x$, $48x$, $36x$, $42x$, and $72x$ represent the number of dollars in their respective dividends.

Then,
$$30x + 15x + 24x + 18x + 48x + 36x + 42x + 72x = 6412.50$$
$$285x = 6412.50$$
$$x = 22.50$$

Hence, $30x = 675$, $15x = 337.50$, $24x = 540$, $18x = 405$, $48x = 1080$, $36x = 810$, $42x = 945$, and $72x = 1620$.

Therefore each shareholder received, respectively, $675, $337.50, $540, $405, $1080, $810, $945, and $1620.

Page 295

2. The entire capital = $75,000 + $45,000 = $120,000;
A's share $= \frac{75000}{120000} = \frac{5}{8}$; A's net earnings $= \frac{5}{8}$ of $11,200 = $7000.
B's share $= \frac{45000}{120000} = \frac{3}{8}$; B's net earnings $= \frac{3}{8}$ of $11,200 = $4200.

3. The entire capital = $11,000 + $15,000 + $6000 = $32,000;
1st partner's share $= \frac{11000}{32000} = \frac{11}{32}$; $\frac{11}{32}$ of $2400 = $825, 1st partner's loss.
2d partner's share $= \frac{15000}{32000} = \frac{15}{32}$; $\frac{15}{32}$ of $2400 = $1125, 2d partner's loss.
3d partner's share $= \frac{6000}{32000} = \frac{3}{16}$; $\frac{3}{16}$ of $2400 = $ 450, 3d partner's loss.

4. The total amount of insurance = $\frac{3}{5}$ of \$28,000 = \$16,800 ;
1st man's share = $\frac{16000}{28000} = \frac{4}{7}$; his insurance = $\frac{4}{7}$ of \$16,800 = \$9600.
2d man's share = $\frac{7000}{28000} = \frac{1}{4}$; his insurance = $\frac{1}{4}$ of \$16,800 = \$4200.
3d man's share = $\frac{5000}{28000} = \frac{5}{28}$; his insurance = $\frac{5}{28}$ of \$16,800 = \$3000.

5. The total investments = \$10,000 + \$3000 + \$6500 + \$3500 = \$23,000.
1st owner's share = $\frac{10000}{23000} = \frac{10}{23}$; 1st owner paid $\frac{10}{23}$ of \$4600 = \$2000.
2d owner's share = $\frac{3000}{23000} = \frac{3}{23}$; 2d owner paid $\frac{3}{23}$ of \$4600 = \$600.
3d owner's share = $\frac{6500}{23000} = \frac{13}{46}$; 3d owner paid $\frac{13}{46}$ of \$4600 = \$1300.
4th owner's share = $\frac{3500}{23000} = \frac{7}{46}$; 4th owner paid $\frac{7}{46}$ of \$4600 = \$700.

Page 296

6. The whole investment = \$2200 + \$1800 + \$2000 = \$6000.

Since the 1st owner had invested $\frac{2200}{6000}$, or $\frac{11}{30}$, of the capital at the beginning, his share of the increased capital was worth $\frac{11}{30}$ of \$10,500, or \$3850.

The original investments of the two remaining partners = \$1800 + \$2000 = \$3800 ;

1st man's share = $\frac{1800}{3800} = \frac{9}{19}$; 2d man's share = $\frac{2000}{3800} = \frac{10}{19}$; hence,
1st man paid $\frac{9}{19}$ of \$3850 = \$1823.684+, or \$1823.68.
2d man paid $\frac{10}{19}$ of \$3850 = \$2026.316−, or \$2026.32.

7. 16% of \$10,000 = \$1600, A's dividend, also B's and C's;
16% of \$18,000 = \$2880, D's dividend.
A's share of the capital, also B's and C's = $\frac{10000}{48000} = \frac{5}{24}$;
D's share of the capital = $\frac{18000}{48000} = \frac{3}{8}$;
$\frac{5}{24}$ of \$2880 = \$600, A's surplus profits, also B's and C's;
$\frac{3}{8}$ of \$2880 = \$1080, D's surplus profits ;
\$10,000 + \$600 = \$10,600, A's increased capital, also B's and C's;
\$18,000 + \$1080 = \$19,080, D's increased capital.

9. B's capital, \$5000 for 9 mo. = \$45,000 for 1 mo.
" " \$6000 for 3 mo. = $\underline{\$18,000}$ for 1 mo.
B's total capital = \$63,000 for 1 mo.
A's capital, \$5000 for 12 mo. = $\underline{\$60,000}$ for 1 mo.
Total investment for both = \$123,000 for 1 mo.
Therefore, A's profits = $\frac{60000}{123000}$ of \$3075 = \$1500.
B's profits = $\frac{63000}{123000}$ of \$3075 = \$1575.

10. A furnished $\frac{3}{5}$ of \$10,000, or \$6000, and B, $\frac{2}{5}$ of \$10,000, or \$4000
A's capital, \$6000 for 12 mo. = \$72,000 for 1 mo.
B's capital, \$4000 for 12 mo. = \$48,000 for 1 mo.
C's capital, \$5000 for 6 mo. = $\underline{\$30,000}$ for 1 mo.
Total investment for both = \$150,000 for 1 mo.

(Solution completed on next page.)

Therefore, A's profits = $\frac{72000}{150000}$ of \$5500 = \$2640.
B's profits = $\frac{48000}{150000}$ of \$5500 = \$1760.
C's profits = $\frac{30000}{150000}$ of \$5500 = \$1100.

11. C's capital, \$40,000 for 12 mo. = \$480,000 for 1 mo.
" " \$25,000 for 4 mo. = $\underline{\$100{,}000}$ for 1 mo.
C's total capital = \$580,000 for 1 mo.
A's capital, \$30,000 for 16 mo. = \$480,000 for 1 mo.
B's capital, \$20,000 for 16 mo. = $\underline{\$320{,}000}$ for 1 mo.
Total investment for all = \$1,380,000 for 1 mo.
Therefore, A's profits = $\frac{480000}{1380000}$ of \$41,400 = \$14,400.
B's profits = $\frac{320000}{1380000}$ of \$41,400 = \$9600.
C's profits = $\frac{580000}{1380000}$ of \$41,400 = \$17,400.

Page 298

32. $4^2 = 16$; hence, in 4 sec. a body will fall (16.08×16) ft., or 257.28 ft.
$15^2 = 225$; hence, in 15 sec. a body will fall (16.08×225) ft., or 3618 ft.

Page 301

2. $729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$; arranging these factors in 2 like groups,

$$729 = (3 \times 3 \times 3) \times (3 \times 3 \times 3)$$

Therefore, $\sqrt{729} = 3 \times 3 \times 3$, or 27.

3. $784 = 2 \times 2 \times 2 \times 2 \times 7 \times 7$; arranging these factors in 2 like groups,

$$784 = (2 \times 2 \times 7) \times (2 \times 2 \times 7)$$

Therefore, $\sqrt{784} = 2 \times 2 \times 7$, or 28.

4. $512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$; arranging these factors in 3 like groups,

$$512 = (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

Therefore, $\sqrt[3]{512} = 2 \times 2 \times 2$, or 8.

5. $729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$; arranging factors in 3 like groups,

$$729 = (3 \times 3) \times (3 \times 3) \times (3 \times 3)$$

Therefore, $\sqrt[3]{729} = 3 \times 3$, or 9.

6. $1024 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$; arranging factors in 2 like groups,

$$1024 = (2 \times 2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2 \times 2)$$

Therefore, $\sqrt{1024} = 2 \times 2 \times 2 \times 2 \times 2$, or 32.

7. $2025 = 5 \times 5 \times 9 \times 9$; arranging factors in 2 like groups,

$$2025 = (5 \times 9) \times (5 \times 9)$$

Therefore, $\sqrt{2025} = 5 \times 9$, or 45.

8. $3375 = 5 \times 5 \times 5 \times 3 \times 3 \times 3$; arranging factors in 3 like groups,

$$3375 = (5 \times 3) \times (5 \times 3) \times (5 \times 3)$$

Therefore, $\sqrt[3]{3375} = 5 \times 3$, or 15.

9. $$1024 = 4 \times 4 \times 4 \times 4 \times 4$$

Therefore, $\sqrt[5]{1024} = 4$.

10. $11{,}664 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 4 \times 4$; arranging factors in 2 like groups,

$$11{,}664 = (3 \times 3 \times 3 \times 4) \times (3 \times 3 \times 3 \times 4)$$

Therefore, $\sqrt{11{,}664} = 3 \times 3 \times 3 \times 4$, or 108.

11. $46{,}656 = 9 \times 9 \times 9 \times 4 \times 4 \times 4$; arranging factors in 3 like groups,

$$46{,}656 = (9 \times 4) \times (9 \times 4) \times (9 \times 4)$$

Therefore, $\sqrt[3]{46{,}656} = 9 \times 4$, or 36.

12. $20{,}736 = 3 \times 3 \times 3 \times 3 \times 4 \times 4 \times 4 \times 4$; arranging factors in 4 like groups,

$$20{,}736 = (3 \times 4) \times (3 \times 4) \times (3 \times 4) \times (3 \times 4)$$

Therefore, $\sqrt[4]{20{,}736} = 3 \times 4$, or 12.

13. $$15{,}625 = 5 \times 5 \times 5 \times 5 \times 5 \times 5$$

Therefore, $\sqrt[6]{15{,}625} = 5$.

14. $$243 = 3 \times 3 \times 3 \times 3 \times 3$$

Therefore, $\sqrt[5]{243} = 3$.

15. $$343 = 7 \times 7 \times 7$$

Therefore, $\sqrt[3]{343} = 7$.

16. $$128 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

Therefore, $\sqrt[7]{128} = 2$.

17. $$625 = 5 \times 5 \times 5 \times 5$$

Therefore, $\sqrt[4]{625} = 5$.

18. The number of inches in one side of the square is $\sqrt{324}$;
$324 = 3 \times 3 \times 6 \times 6$; arranging factors in 2 like groups,

$$324 = (3 \times 6) \times (3 \times 6)$$

Therefore, $\sqrt{324} = 3 \times 6$, or 18, the number of inches.

19. The number of inches in one edge of the cube is $\sqrt[3]{8000}$;

$$8000 = 20 \times 20 \times 20$$

Therefore, $\sqrt[3]{8000} = 20$, the number of inches.

Page 303

3. 28′09 | 53
25
2 × 50 = 100 | 309
3
103 | 309

4. 26′01 | 51
25
2 × 50 = 100 | 101
1
101 | 101

5. 67′24 | 82
64
2 × 80 = 160 | 324
2
162 | 324

6. 19′36 | 44
16
2 × 40 = 80 | 336
4
84 | 336

7. 82′81 | 91
81
2 × 90 = 180 | 181
1
181 | 181

8. 51′84 | 72
49
2 × 70 = 140 | 284
2
142 | 284

9. 11′56 | 34
9
2 × 30 = 60 | 256
4
64 | 256

10. 68′89 | 83
64
2 × 80 = 160 | 489
3
163 | 489

11. 10′89 | 33
9
2 × 30 = 60 | 189
3
63 | 189

12. 88′36 | 94
81
2 × 90 = 180 | 736
4
184 | 736

13. 37′21 | 61
36
2 × 60 = 120 | 121
1
121 | 121

14. 70′56 | 84
64
2 × 80 = 160 | 656
4
164 | 656

15. 21′16 | 46
16
2 × 40 = 80 | 516
6
86 | 516

16. 90′25 | 95
81
2 × 90 = 180 | 925
5
185 | 925

17. 57′76 | 76
49
2 × 70 = 140 | 876
6
146 | 876

18. 32′49 | 57
25
2 × 50 = 100 | 749
7
107 | 749

19. 24′01 | 49
16
2 × 40 = 80 | 801
9
89 | 801

20. 96′04 | 98
81
2 × 90 = 180 | 1504
8
188 | 1504

21. 62′41 | 79
49
2 × 70 = 140 | 1341
9
149 | 1341

22. 98′01 | 99
81
2 × 90 = 180 | 1701
9
189 | 1701

23. 72′25 | 85
64
2 × 80 = 160 | 825
5
165 | 825

Hence, the side of the square is 85 in.

24.

$$\begin{array}{rl}
 & 14'44\,\underline{|38} \\
 & 9 \\
2 \times 30 = 60 & \big|\,544 \\
\underline{8} & \big| \\
68 & \big|\,\underline{544}
\end{array}$$

Hence, the side of the square is 38 in.

25.

$$\begin{array}{rl}
 & 22'09\,\underline{|47} \\
 & 16 \\
2 \times 40 = 80 & \big|\,609 \\
\underline{7} & \big| \\
87 & \big|\,\underline{609}
\end{array}$$

Hence, the side of the square is 47 in.

26.

$$\begin{array}{rl}
 & 8'41\,\underline{|29} \\
 & 4 \\
2 \times 20 = 40 & \big|\,441 \\
\underline{9} & \big| \\
49 & \big|\,\underline{441}
\end{array}$$

Hence, the side of the square is 29 ft.

27.

$$\begin{array}{rl}
 & 42'25\,\underline{|65} \\
 & 36 \\
2 \times 60 = 120 & \big|\,625 \\
\underline{5} & \big| \\
125 & \big|\,\underline{625}
\end{array}$$

Hence, the side of the square is 65 cm.

28.

$$\begin{array}{rl}
 & 46'24\,\underline{|68} \\
 & 36 \\
2 \times 60 = 120 & \big|\,1024 \\
\underline{8} & \big| \\
128 & \big|\,\underline{1024}
\end{array}$$

Hence, the side of the square is 68 cm.

29.

$$\begin{array}{rl}
 & 77'44\,\underline{|88} \\
 & 64 \\
2 \times 80 = 160 & \big|\,1344 \\
\underline{8} & \big| \\
168 & \big|\,\underline{1344}
\end{array}$$

Hence, the side of the square is 88 m.

30. 4761 a. = 4761 sq. Dm.

$$\begin{array}{rl}
 & 47'61\,\underline{|69} \\
 & 36 \\
2 \times 60 = 120 & \big|\,1161 \\
\underline{9} & \big| \\
129 & \big|\,\underline{1161}
\end{array}$$

Hence, the side of the square is 69 Dm.

31. 1225 Ha. = 1225 sq. Hm.

$$\begin{array}{rl}
 & 12'25\,\underline{|35} \\
 & 9 \\
2 \times 30 = 60 & \big|\,325 \\
\underline{5} & \big| \\
65 & \big|\,\underline{325}
\end{array}$$

Hence, the side of the square is 35 Hm.

32. Since 12.1 A. = 12.1 × 160 sq. rd., or 1936 sq. rd., the number of rods in one side of the field = $\sqrt{1936}$, or 44 rd. (see Ex. 6, solution); hence, the length of fence required to inclose the field = 4 × 44 rd., or 176 rd.

33. The area = (144 × 64) sq. ft. = 9216 sq. ft.

$$\begin{array}{rl}
 & 92'16\,\underline{|96} \\
 & 81 \\
2 \times 90 = 180 & \big|\,1116 \\
\underline{6} & \big| \\
186 & \big|\,\underline{1116}
\end{array}$$

Hence, the side of a square lot of 9216 sq. ft. is 96 ft.

34.

$$\begin{array}{rl}
 & 56'25\,\underline{|75} \\
 & 49 \\
2 \times 70 = 140 & \big|\,725 \\
\underline{5} & \big| \\
145 & \big|\,\underline{725}
\end{array}$$

Hence, he shall place 75 men on a side.

Page 305

2.
```
      1'51'29|123
      1
  22 | 51
     | 44
  243 | 729
      | 729
```

3.
```
      2'43'36|156
      1
  25 | 143
     | 125
  306 |  1836
      |  1836
```

4.
```
      1'36'89|117
      1
  21 |  36
     |  21
  227 | 1589
      | 1589
```

5.
```
      3'09'76|176
      1
  27 | 209
     | 189
  346 |  2076
      |  2076
```

6.
```
      4'45'21|211
      4
  41 | 45
     | 41
  421 | 421
      | 421
```

7.
```
      9'30.25|30.5
      9
  605 | 3025
      | 3025
```

8.
```
      6'55.36|25.6
      4
  45 | 255
     | 225
  506 |  3036
      |  3036
```

9.
```
      2'82.24|16.8
      1
  26 | 182
     | 156
  328 |  2624
      |  2624
```

10.
```
      11.02'24|3.32
      9
  63 | 202
     | 189
  662 | 1324
      | 1324
```

11.
```
      14.59 24|3.82
      9
  68 | 559
     | 544
  762 | 1524
      | 1524
```

12.
```
      .55'50'25|.745
      49
  144 | 650
      | 576
  1485 | 7425
       | 7425
```

13.
```
      .63'36'16|.796
      49
  149 | 1436
      | 1341
  1586 |  9516
       |  9516
```

14.
```
      .99'40'09|.997
      81
  189 | 1840
      | 1701
  1987 | 13909
       | 13909
```

15.
```
      .00'67'56'84|.0822
      64
  162 | 356
      | 324
  1642 | 3284
       | 3284
```

16.
```
      .00'76'73'76|.0876
      64
  167 | 1273
      | 1169
  1746 | 10476
       | 10476
```

17.
```
      2'07'36|144
      1
  24 | 107
     |  96
  284 | 1136
      | 1136
```

```
      3'06'25|175
      1
  27 | 206
     | 189
  345 | 1725
      | 1725
```

Therefore, $\sqrt{\frac{20736}{30625}} = \frac{144}{175}$.

18.

2′59′21 | 161
1
26 | 159
156
321 | 321
321

5′06′25 | 225
4
42 | 106
84
445 | 2225
2225

Therefore, $\sqrt{\frac{25921}{50625}} = \frac{161}{225}$.

19.

$32\frac{164}{625} = 32.2624$
32.26′24 | 5.68
25
106 | 726
636
1128 | 9024
9024

Therefore, $\sqrt{32\frac{164}{625}} = 5.68$, or $5\frac{17}{25}$.

20.

$87,560\frac{521}{1024} = 87560.5087890625$
8′75′60.50′87′89′06′25 | 295.90625
4
49 | 475
441
585 | 3460
2925
5909 | 53550
53181
591806 | 3698789
3550836
5918122 | 14795306
11836244
59181245 | 295906225
295906225

Therefore, $\sqrt{87560\frac{521}{1024}} = 295.90625$, or $295\frac{29}{32}$.

21.

2.00 | 1.414+
1
24 | 100
96
281 | 400
281
2824 | 11900
11296
604

Therefore, $\sqrt{2} = 1.414+$.

22.

3.00 | 1.732+
1
27 | 200
189
343 | 1100
1029
3462 | 7100
6924
176

Therefore, $\sqrt{3} = 1.732+$.

23.

5.00 | 2.236+
4
42 | 100
84
443 | 1600
1329
4466 | 27100
26796
304

Therefore, $\sqrt{5} = 2.236+$.

Page 305

2. 1′51′29 | 123
1
22 | 51
44
243 | 729
729

3. 2′43′36 | 156
1
25 | 143
125
306 | 1836
1836

4. 1′36′89 | 117
1
21 | 36
21
227 | 1589
1589

5. 3′09′76 | 176
1
27 | 209
189
346 | 2076
2076

6. 4′45′21 | 211
4
41 | 45
41
421 | 421
421

7. 9′30.25 | 30.5
9
605 | 3025
3025

8. 6′55.36 | 25.6
4
45 | 255
225
506 | 3036
3036

9. 2′82.24 | 16.8
1
26 | 182
156
328 | 2624
2624

10. 11.02′24 | 3.32
9
63 | 202
189
662 | 1324
1324

11. 14.59 24 | 3.82
9
68 | 559
544
762 | 1524
1524

12. .55′50′25 | .745
49
144 | 650
576
1485 | 7425
7425

13. .63′36′16 | .796
49
149 | 1436
1341
1586 | 9516
9516

14. .99′40′09 | .997
81
189 | 1840
1701
1987 | 13909
13909

15. .00′67′56′84 | .0822
64
162 | 356
324
1642 | 3284
3284

16. .00′76′73′76 | .0876
64
167 | 1273
1169
1746 | 10476
10476

17. 2′07′36 | 144
1
24 | 107
96
284 | 1136
1136

3′06′25 | 175
1
27 | 206
189
345 | 1725
1725

Therefore, $\sqrt{\frac{20736}{30625}} = \frac{144}{175}$.

18.
2′59′21 | 161
1
26 | 159
156
321 | 321
321

5′06′25 | 225
4
42 | 106
84
445 | 2225
2225

Therefore, $\sqrt{\frac{25921}{50625}} = \frac{161}{225}$.

19. $32\frac{164}{625} = 32.2624$
32.26′24 | 5.68
25
106 | 726
636
1128 | 9024
9024

Therefore, $\sqrt{32\frac{164}{625}} = 5.68$, or $5\frac{17}{25}$.

20. $87{,}560\frac{521}{1024} = 87560.5087890625$
8′75′60.50′87′89′06′25 | 295.90625
4
49 | 475
441
585 | 3460
2925
5909 | 53550
53181
591806 | 3698789
3550836
5918122 | 14795306
11836244
59181245 | 295906225
295906225

Therefore, $\sqrt{87560\frac{521}{1024}} = 295.90625$, or $295\frac{29}{32}$.

21.
2.00 | 1.414+
1
24 | 100
96
281 | 400
281
2824 | 11900
11296
604

Therefore, $\sqrt{2} = 1.414+$.

22.
3.00 | 1.732+
1
27 | 200
189
343 | 1100
1029
3462 | 7100
6924
176

Therefore, $\sqrt{3} = 1.732+$.

23.
5.00 | 2.236+
4
42 | 100
84
443 | 1600
1329
4466 | 27100
26796
304

Therefore, $\sqrt{5} = 2.236+$.

24. 8.00 | 2.828+
4
48 | 400
384
562 | 1600
1124
5648 | 47600
45184
2416

25. 6.00 | 2.449+
4
44 | 200
176
484 | 2400
1936
4889 | 46400
44001
2399

26. 7.00 | 2.6457+ or 2.646−
4
46 | 300
276
524 | 2400
2096
5285 | 30400
26425
52907 | 397500
370349

27. $\frac{1}{3}$, or $\frac{3}{9} = 3 \times \frac{1}{9}$;
$\sqrt{3} = 1.732+$ (Ex. 22);
$\sqrt{\frac{1}{9}} = \frac{1}{3}$;
$\sqrt{3 \times \frac{1}{9}} = 1.732+ \times \frac{1}{3} =$ .577+;
Hence, $\sqrt{\frac{1}{3}} = .577+$.

28. $\frac{1}{2}$, or $\frac{2}{4} = 2 \times \frac{1}{4}$;
$\sqrt{2} = 1.414+$ (Ex. 21);
$\sqrt{\frac{1}{4}} = \frac{1}{2}$;
$\sqrt{2 \times \frac{1}{4}} = 1.414+ \times \frac{1}{2} =$ .707+;
Hence, $\sqrt{\frac{1}{2}} = .707+$.

29. .20 | .447+
16
84 | 400
336
887 | 6400
6209
191

Therefore, $\sqrt{\frac{1}{5}} = .447+$.

30. .10 | .316+
9
61 | 100
61
626 | 3900
3756
144

31. 2.50 | 1.581+
1
25 | 150
125
308 | 2500
2464
3161 | 3600
3161
439

32. 3.60 | 1.897+
1
28 | 260
224
369 | 3600
3321
3787 | 27900
26509
1391

33. .78′54 | .886+
64
168 | 1454
1344
1766 | 11000
10596
404

34. .41′26′50 | .642+
36
124 | 526
496
1282 | 3050
2564
486

35. .74′00′06′30 | .8602+ or .860+
64
166 | 1000
996
17202 | 40630
34404

37. 1.5 A. = 65,340 sq. ft.

$$\begin{array}{r|l}
 & 6'53'40.00 \ \underline{|255.6^{+}} \\
 & 4 \\
45 & 253 \\
 & \underline{225} \\
505 & 2840 \\
 & \underline{2525} \\
5106 & 31500 \\
 & \underline{30636} \\
 & 864
\end{array}$$

Hence, the side of the square is 255.6+ ft.

38.

$$\begin{array}{r|l}
 & 1'20'00.00 \ \underline{|109.5^{+}} \\
 & 1 \\
209 & 2000 \\
 & \underline{1881} \\
2185 & 11900 \\
 & \underline{10925} \\
 & 975
\end{array}$$

Hence, the side of the square is 109.5+ ft.

39.

$$\begin{array}{r|l}
 & 37'50'00.00 \ \underline{|612.37^{+}} \text{ or } 612.4^{-} \\
 & 36 \\
121 & 150 \\
 & \underline{121} \\
1222 & 2900 \\
 & \underline{2444} \\
12243 & 45600 \\
 & \underline{36729} \\
122467 & 887100 \\
 & \underline{857269}
\end{array}$$

Hence, the side of the square is 612.4− ft.

Page 306

40. 110 yd. = 330 ft.; hence, the area of the field = (330 × 160) sq. ft. = 52,800 sq. ft.

Then the number of feet in the side of a square field having the same area = $\sqrt{52,800}$, or 229.8− ft.

$$\begin{array}{r|l}
 & 5'28'00.00 \ \underline{|229.78^{+}} \text{ or } 229.8^{-} \\
 & 4 \\
42 & 128 \\
 & \underline{84} \\
449 & 4400 \\
 & \underline{4041} \\
4587 & 35900 \\
 & \underline{32109} \\
45948 & 379100 \\
 & \underline{367584}
\end{array}$$

41. 20 A. = 20 × 160 sq. rd. = 3200 sq. rd.

Let x = the number of rods in width

Then, $2x$ = the number of rods in length

$x(2x)$, or $2x^2$ = the number of square rods in area

$$2x^2 = 3200$$
$$x^2 = 1600$$
$$x = \sqrt{1600} = 40, \text{ the width in rods}$$
$$2x = 80, \text{ the length in rods.}$$

42. 90 A. = 90 × 160 sq. rd. = 14,400 sq. rd.

Let x = the number of rods in width

Then, $4x$ = the number of rods in length

$x(4x)$, or $4x^2$ = the number of square rods in area

$$4x^2 = 14,400$$
$$x^2 = 3600$$
$$x = \sqrt{3600} = 60, \text{ the width in rods}$$
$$4x = 240, \text{ the length in rods.}$$

43. Since the field is 60 rd. wide and 240 rd. long [Ex. 42, ans.], the length of fence necessary to inclose it $= 2 \times (60 \text{ rd.} + 240 \text{ rd.})$, or 600 rd.

The number of rods in the side of a square field whose area is 14,400 sq. rd. $= \sqrt{14{,}400}$, or 120 rd., and the length of fence necessary to inclose the field $= 4 \times 120$ rd., or 480 rd.

Hence, the first field requires 600 rd. − 480 rd., or 120 rd., more fence.

---

2. Let $x =$ the number of inches in the hypotenuse

$x^2 = 5^2 + 12^2 = 25 + 144 = 169$

$x = \sqrt{169} = 13$, the length of the hypotenuse in inches.

Page 307

3. (*a*) $x^2 = 8^2 + 15^2 = 64 + 225 = 289$ (*b*) $x^2 = 15^2 - 9^2 = 225 - 81 = 144$

$x = \sqrt{289} = 17.$ $x = \sqrt{144} = 12.$

(*c*) $x^2 = 45^2 + 24^2 = 2025 + 576 = 2601$

$x = \sqrt{2601} = 51.$

$$\begin{array}{rl} & 26'01\ \underline{|\,51} \\ & 25 \\ 101 & |\,101 \\ & \underline{|\,101} \end{array}$$

(*d*) $x^2 = 30^2 - 18^2 = 900 - 324 = 576$

$x = \sqrt{576} = 24.$

4. Let $x =$ the number of inches in the diagonal

$x^2 = 1^2 + 1^2 = 1 + 1 = 2$

$x = \sqrt{2} = 1.414^+$ [see p. 305, Ex. 21]

Hence, the length of the diagonal is 1.414^+ in.

5. Let $x =$ the number of inches in the diagonal

$x^2 = 4^2 + (7\tfrac{1}{2})^2 = 16 + 56\tfrac{1}{4} = 72\tfrac{1}{4}$

Hence, the area of the square on the diagonal is $72\tfrac{1}{4}$ sq. in., or 72.25 sq. in.

6. The area of the 5-inch square = 25 sq. in.

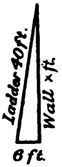
Let $x =$ the length of the diagonal in inches

$x^2 = 5^2 + 5^2 = 25 + 25 = 50$

Hence, the area of the square on the diagonal is 50 sq. in.

Then, $\left\{\begin{matrix}\text{area of square} \\ \text{on diagonal}\end{matrix}\right\} : \left\{\begin{matrix}\text{area of 5-} \\ \text{in. square}\end{matrix}\right\} :: 50 : 25$, or as $2 : 1$.

9.



The ladder, the wall, and the ground between the foot of the ladder and the wall form a right-angled triangle, whose hypotenuse is 40 ft.

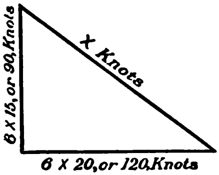
$x^2 = 40^2 - 6^2 = 1600 - 36 = 1564$

$x = \sqrt{1564} = 39.55^-$

Hence, the top of the ladder is 39.55⁻ ft. from the ground.

```
       15'64.00 |39.547+, or
        9        39.55-
 69    |664
       |621
 785   |4300
       |3925
 7904  |37500
       |31616
 79087 |588400
       |553609
```

10.



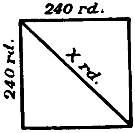
The courses of the two vessels formed the legs of a right-angled triangle, the length of whose hypotenuse was the distance between the vessels.

$x^2 = 90^2 + 120^2 = 8100 + 14,400 = 22,500$

$x = \sqrt{22500} = 150$

Hence, the vessels were 150 knots apart.

11.



360 A. = 360 × 160 sq. rd. = 57,600 sq. rd.; hence, the number of rods in one side of the farm = $\sqrt{57600}$, or 240 rd. Then,

$x^2 = 240^2 + 240^2 = 57,600 + 57,600 = 115,200$

$x = \sqrt{115200} = 339.41^+$

Hence, the opposite corners of the farm are 339.41+ rd. apart.

```
       11'52'00.00|339.41+
        9
 63    |252
       |189
 669   |6300
       |6021
 6784  |27900
       |27136
 67881 |76400
       |67881
         8519
```

Page 310

1. The area = (14.5 × 6) sq. in. = 87 sq. in.
2. The area = (320 × 4) sq. rd. = 1280 sq. rd., or 8 A.
3. The area = (200 × 9) sq. m. = 1800 sq. m.
4. 500 m. = .5 Km.; hence, the area = (10 × .5) sq. Km. = 5 sq. Km.
5. The area = ($12\frac{3}{4} \times 3\frac{1}{2}$) sq. ft. = $44\frac{5}{8}$ sq. ft.
6. 4 rd. $5\frac{1}{2}$ ft. = $4\frac{1}{3}$ rd.; hence, the area = ($24 \times 4\frac{1}{3}$) sq. rd. = 104 sq. rd.
7. Since the area of the parallelogram is the product of its base and its altitude, the number of inches in the altitude = 51 ÷ $8\frac{1}{2}$, or 6 in.

Page 311

1. The area $= \frac{1}{2}$ of (24×12) sq. ft. $= 144$ sq. ft.

2. The area $= \frac{1}{2}$ of (45×16) sq. rd. $= 360$ sq. rd., or $2\frac{1}{4}$ A.

3. The area $= \frac{1}{2}$ of (44×26) sq. m. $= 572$ sq. m.

4. 8 Dm. $= 80$ m.; hence, the area $= \frac{1}{2}$ of (80×5.2) sq. m. $= 208$ sq. m.

5. Since the area is equal to $\frac{1}{2}$ the product of the base and altitude, the number of feet in the altitude $= (2 \times 84) \div 16$, or $10\frac{1}{2}$ ft.

6. 1 ft. 2 in. $= 14$ in.; since the area is equal to $\frac{1}{2}$ the product of the base and altitude, the number of inches in the base $= (2 \times 147) \div 14$, or 21 in.

Page 312

1. The area $= \frac{1}{2}$ of $(3\frac{1}{2} \times [7 + 9])$ sq. in. $= \frac{1}{2}$ of $(3\frac{1}{2} \times 16)$ sq. in. $= 28$ sq. in.

2. The area $= \frac{1}{2}$ of (5×32) sq. cm. $= 80$ sq. cm.

3. Considering 28 ft. as the altitude and 1 ft. and $1\frac{1}{2}$ ft. as the bases of the trapezoid, the area $= \frac{1}{2}$ of $(28 \times [1 + 1\frac{1}{2}])$ sq. ft. $= \frac{1}{2}$ of $(28 \times 2\frac{1}{2})$ sq. ft. $= 35$ sq. ft.

The plank contains 2×35, or 70, board feet.

4. Let $x =$ the number of inches in the upper base.

Since area $= \frac{1}{2}$ of alt. $\times$ sum of bases,

$$36 = \tfrac{1}{2} \text{ of } 4 \times (10 + x) = 2 \times (10 + x)$$
$$36 = 20 + 2x$$
$$18 = 10 + x$$
$$x = 8;$$ hence, the upper base is 8 in.

5. The cornfield was a trapezoid whose altitude was 160 rd. and whose bases were 80 rd. and 40 rd.; hence,

The number of square rods in area $= \frac{1}{2}$ of $160 \times (80 + 40) = 9600$;

Therefore the area of the cornfield was 9600 sq. rd., or 60 A.

6. The wheat field was a trapezoid with an altitude of 96 rd. and with bases of 56 rd. and 80 rd.; hence,

The number of square rods in area $= \frac{1}{2}$ of $96 \times (56 + 80) = 6528$;

Therefore the area of the field of wheat was 6528 sq. rd., or 40 A. 128 sq. rd.

7. The field of oats was a triangle whose base was 56 rd. and whose altitude was 224 rd.; hence,

The area $= \frac{1}{2}$ of (56×224) sq. rd. $= 6272$ sq. rd., or 39 A. 32 sq. rd.

8. The field of hay was a trapezoid having bases of 80 rd. and 65 rd. + $36\frac{1}{4}$ rd., or $101\frac{1}{4}$ rd., and an altitude of 85 rd.; hence,

The area, in square rods = $\frac{1}{2}$ of $85 \times (80 + 101\frac{1}{4}) = 7703\frac{1}{8}$;

Therefore the area of the hay field was $7703\frac{1}{8}$ sq. rd., or 48 A. $23\frac{1}{8}$ sq. rd.

9. The field devoted to potatoes was a trapezoid whose bases were 55 rd. and $36\frac{1}{4}$ rd. and whose altitude was 75 rd.; hence,

The number of square rods in area = $\frac{1}{2}$ of $75 \times (55 + 36\frac{1}{4}) = 3421\frac{7}{8}$;

Therefore the area of this field was $3421\frac{7}{8}$ sq. rd., or 21 A. $61\frac{7}{8}$ sq. rd.

10. The area of one part = (35×65) sq. rd. = 2275 sq. rd.;

The area of the remainder = (25×40) sq. rd. = 1000 sq. rd.;

Then the pasture contained 2275 sq. rd. + 1000 sq. rd. = 3275 sq. rd., or 20 A. 75 sq. rd.

11. This field contained (40×40) sq. rd. = 1600 sq. rd., or 10 A.

12. By the use of the answers to Ex. 5–11, the area of the farm = 60 A. + 40 A. 128 sq. rd. + 39 A. 32 sq. rd. + 48 A. $23\frac{1}{8}$ sq. rd. + 21 A. $61\frac{7}{8}$ sq. rd. + 20 A. 75 sq. rd. + 10 A. = 240 A.

Since the farm was 224 rd. + 96 rd., or 320 rd., long and 80 rd. + 40 rd., or 120 rd., wide, its area = (320×120) sq. rd. = 38,400 sq. rd., or 240 A.

13. Mink Brook may be considered the hypotenuse of a right-angled triangle, one of whose legs is 80 rd. long, and the other, 96 rd. + 224 rd., or 320 rd.

Let x = number of rods in hypotenuse.

$$x^2 = 80^2 + 320^2 = 6400 + 102{,}400 = 108{,}800$$

$$x = \sqrt{108800} = 329.85^-$$

Therefore the length of Mink Brook within Mr. Drake's farm is 329.85 rd.

$$\begin{array}{r|l}
\multicolumn{1}{r}{10'88'00.00} & \underline{329.848+} \\
\multicolumn{1}{r}{9} & \quad\text{or} \\
62 & 188 \qquad 329.85^- \\
 & 124 \\
649 & 6400 \\
 & 5841 \\
6588 & 55900 \\
 & 52704 \\
65964 & 319600 \\
 & 263856 \\
659688 & 5574400 \\
 & 5277504
\end{array}$$

Page 314

1. Since a township is 6 mi. square it contains (6×6) sq. mi., or 23,040 A.

Since a section is 1 mi. square it contains 640 A.

A quarter-quarter section contains $\frac{1}{4}$ of $\frac{1}{4}$ of 640 A., or 40 A.

2. Description in full: the northeast quarter of section 14 of the third township north of the base line in the fifth range west of the principal meridian.

This tract of land, $\frac{1}{4}$ of a section, contains $\frac{1}{4}$ of 640 A., or 160 A.

3. Description in full: the western half of the northwest quarter of section 27 of the fifth township south of the base line in the fourth range east of the principal meridian.

This tract, $\frac{1}{2}$ of $\frac{1}{4}$ of a section, contains $\frac{1}{2}$ of $\frac{1}{4}$ of 640 A., or 80 A.

4. Description in full: the southeast quarter of the northeast quarter of section 36 of the second township north of the base line in the first range west of the principal meridian.

This tract, $\frac{1}{4}$ of $\frac{1}{4}$ of a section, contains $\frac{1}{4}$ of $\frac{1}{4}$ of 640 A., or 40 A.

5. Description in full: the northeast quarter of the northwest quarter of section 18 of the fourth township south of the base line in the fifth range east of the principal meridian.

This tract, $\frac{1}{4}$ of $\frac{1}{4}$ of a section, contains $\frac{1}{4}$ of $\frac{1}{4}$ of 640 A., or 40 A.

6. Description in full: the southern half, and the western half of the northwest quarter, of section 22 of the third township south of the base line in the sixth range west of the principal meridian.

This tract, $\frac{1}{2}$ of a section plus $\frac{1}{2}$ of $\frac{1}{4}$ of a section, or $\frac{5}{8}$ of a section, contains $\frac{5}{8}$ of 640 A., or 400 A.

7. The value of these 80 A. (Ex. 3, ans.) $= 80 \times \$25.50$, or \$2040.

8. Since a section is a square, the southeast quarter of the northeast quarter is also a square and has an area of 40 A., or 6400 sq. rd.

The number of rods on one side of this tract $= \sqrt{6400}$, or 80 rd., and the length of fence required to inclose it $= 4 \times 80$ rd., or 320 rd.

9. $\frac{1}{4}$ of a section plus $\frac{1}{2}$ of $\frac{1}{4}$ of a section $= \frac{3}{8}$ of 640 A. $= 240$ A.;
At \$18.75 per acre this land is worth $240 \times \$18.75$, or \$4500.

Page 316

1. The perimeter $= 6 \times 6$ in., or 36 in.;
The area $= \frac{1}{2}$ of (36×5.2) sq. in. $= 93.6$ sq. in.

2. The apothem is half the length of one side, or 8 in.;
The perimeter $= 4 \times 16$ in., or 64 in.;
The area by § 572 $= \frac{1}{2}$ of (64×8) sq. in. $= 256$ sq. in.;
Multiplying base by altitude, the area $= (16 \times 16)$ sq. in. $= 256$ sq. in.

3. The perimeter $= 8 \times 9$ in., or 72 in.;
The area $= \frac{1}{2}$ of (72×10.86) sq. in. $= 390.96$ sq. in.

4. Since the area is equal to $\frac{1}{2}$ the product of the perimeter and the apothem, the number of inches in the perimeter of this pentagon $= (2 \times 61.8) \div 4.12$, or 30 in.;

Hence, one side of the pentagon $= \frac{1}{5}$ of 30 in., or 6 in.

Page 317

1. $3\frac{1}{7} \times 35$ in. $= 110$ in., the circumference.

2. $3\frac{1}{7} \times 77$ ft. $= 242$ ft., the circumference.

3. $3\frac{1}{7} \times 63$ yd. $= 198$ yd., the circumference.

4. $3\frac{1}{7} \times 49$ rd. $= 154$ rd., the circumference.

5. $3\frac{1}{7} \times 84$ m. $= 264$ m., the circumference.

6. $3\frac{1}{7} \times 56$ cm. $= 176$ cm., the circumference.

7. $3\frac{1}{7} \times 126$ m. $= 396$ m., the circumference.

8. $3\frac{1}{7} \times 168$ mm. $= 528$ mm., the circumference.

9. The circumference $= 2 \times 3\frac{1}{7} \times 28$ ft. $= 176$ ft.

10. The circumference $= 2 \times 3\frac{1}{7} \times 42$ ft. $= 264$ ft.

11. The circumference $= 2 \times 3\frac{1}{7} \times 91$ rd. $= 572$ rd.

12. The circumference $= 2 \times 3\frac{1}{7} \times 11.9$ m. $= 74.8$ m.

13. The circumference $= 2 \times 3\frac{1}{7} \times 13.3$ Hm. $= 83.6$ Hm.

14. The circumference $= 2 \times 3\frac{1}{7} \times 5.88$ cm. $= 36.96$ cm.

15. The circumference $= 2 \times 3\frac{1}{7} \times 24.5$ ft. $= 154$ ft.

16. The circumference $= 2 \times 3\frac{1}{7} \times 36.4$ in. $= 228.8$ in.

17. The diameter $= 88$ yd. $\div 3\frac{1}{7}$, or 28 yd.

18. The diameter $= 55$ ft. $\div 3\frac{1}{7}$, or $17\frac{1}{2}$ ft.

19. The diameter $= 12.1$ in. $\div 3\frac{1}{7}$, or 3.85 in.

20. The diameter $= 3.74$ cm. $\div 3\frac{1}{7}$, or 1.19 cm.

21. The diameter $= 25.3$ m. $\div 3\frac{1}{7}$, or 8.05 m.

22. The diameter $= 4.84$ Dm. $\div 3\frac{1}{7}$, or 1.54 Dm.

23. The diameter $= 990$ rd. $\div 3\frac{1}{7}$, or 315 rd.

24. The diameter $= 649$ yd. $\div 3\frac{1}{7}$, or $206\frac{1}{2}$ yd.

25. The circumference $= 3.1416 \times 12$ ft., or 37.6992 ft.

26. The circumference $= 3.1416 \times 20$ m., or 62.832 m.

27. The circumference $= 3.1416 \times 15\frac{1}{2}$ yd., or 48.6948 yd.

28. The circumference $= 3.1416 \times 22\frac{3}{4}$ rd., or 71.4714 rd.

29. The circumference of the wheel $= 3\frac{1}{7} \times 3\frac{1}{2}$ ft.; or 11 ft.; since the wagon advances 11 ft. with every revolution of the wheel, when the wheel has made 100 revolutions the wagon will have gone 1100 ft.

30. Mary's seat revolves in the circumference of a circle whose radius is 7 ft., John's in one whose radius is $10\frac{1}{2}$ ft.; then in one revolution Mary rides $2 \times 3\frac{1}{7} \times 7$ ft., or 44 ft., and John rides $2 \times 3\frac{1}{7} \times 10\frac{1}{2}$ ft., or 66 ft.; hence, John rides 66 ft. − 44 ft., or 22 ft., farther.

Page 318

1. The area $= (3\frac{1}{7} \times 14^2)$ sq. in. $= (3\frac{1}{7} \times 196)$ sq. in. $= 616$ sq. in.

2. The area $= (3\frac{1}{7} \times 35^2)$ sq. ft. $= (3\frac{1}{7} \times 1225)$ sq. ft. $= 3850$ sq. ft.

3. The area $= (3\frac{1}{7} \times 2.8^2)$ sq. rd. $= (3\frac{1}{7} \times 7.84)$ sq. rd. $= 24.64$ sq. rd.

4. The area $= (3\frac{1}{7} \times 4.2^2)$ sq. m. $= (3\frac{1}{7} \times 17.64)$ sq. m. $= 55.44$ sq. m.

5. The area $= (3\frac{1}{7} \times 6.3^2)$ sq. cm. $= (3\frac{1}{7} \times 39.69)$ sq. cm. $= 124.74$ sq. cm.

6. The area $= (3\frac{1}{7} \times .91^2)$ sq. dm. $= (3\frac{1}{7} \times .8281)$ sq. dm. $= 2.6026$ sq. dm.

7. The area $= (3\frac{1}{7} \times .07^2)$ sq. ft. $= (3\frac{1}{7} \times .0049)$ sq. ft. $= .0154$ sq. ft.

8. The area $= (3\frac{1}{7} \times 10.5^2)$ sq. m. $= (3\frac{1}{7} \times 110.25)$ sq. m. $= 346.5$ sq. m.

9. The surface that can be watered is a circle whose radius is 42 ft.;
Hence, its area $= (3\frac{1}{7} \times 42^2)$ sq. ft. $= 5544$ sq. ft.

10. The radius $= \frac{21}{2}$ ft.; hence, the area $= (3\frac{1}{7} \times \frac{21}{2} \times \frac{21}{2})$ sq. ft. $= 346.5$ sq. ft.

11. The diameter $= 22$ ft. $\div 3\frac{1}{7}$, or 7 ft.; the radius $= \frac{1}{2}$ of 7 ft., or $\frac{7}{2}$ ft.;
Then the number of square feet in area $= 3\frac{1}{7} \times (\frac{7}{2})^2$, or 38.5 sq. ft.

12. The surface over which the cow can graze is a circle with a radius of $17\frac{1}{2}$ ft.

Therefore the area $= [3\frac{1}{7} \times (17\frac{1}{2})^2]$ sq. ft. $= 962\frac{1}{2}$ sq. ft.

13. $\frac{1}{2}$ A. $= 80$ sq. rd.;
Since 80 sq. rd. = the area $= \pi r^2$,

$$r^2 = 80 \div 3\frac{1}{7} = \frac{280}{11}$$

$$r = \sqrt{\frac{280}{11}} = \sqrt{25.4545^+} = 5.05^-$$

Hence, the radius is 5.05 rd.

$$\begin{array}{rll}
 & 25.45'45'45 & \underline{|\,5.045^{+}} \\
 & \underline{25} & \quad\text{or} \\
1004 & \quad 4545 & \quad 5.05^{-} \\
 & \quad \underline{4016} & \\
10085 & 52945 & \\
 & \underline{50425} &
\end{array}$$

Page 321

1. The perimeter, or circumference, of the base $= 3\frac{1}{7} \times 2$ ft., or $6\frac{2}{7}$ ft.;
The convex surface $= (5 \times 6\frac{2}{7})$ sq. ft. $= 31\frac{3}{7}$ sq. ft.

2. The perimeter of the base $= 3 \times 2$ cm., or 6 cm.;
The convex surface $= (4 \times 6)$ sq. cm. $= 24$ sq. cm.

3. The perimeter of the base $= 4 \times 2\frac{1}{2}$ ft., or 10 ft.;
The convex surface $= (10 \times 6)$ sq. ft. $= 60$ sq. ft.

4. The circumference of the base $= 3\frac{1}{7} \times 3$ ft., or $9\frac{3}{7}$ ft.;
The convex surface $= (9\frac{3}{7} \times 8)$ sq. ft. $= 75\frac{3}{7}$ sq. ft.;
The area of each base in square feet, $\pi r^2 = 3\frac{1}{7} \times (\frac{3}{2})^2$, or $7\frac{1}{14}$ sq. ft.;
The area of the two bases $= 2 \times 7\frac{1}{14}$ sq. ft., or $14\frac{1}{7}$ sq. ft.;
The entire surface $= 75\frac{3}{7}$ sq. ft. $+ 14\frac{1}{7}$ sq. ft. $= 89\frac{4}{7}$ sq. ft.

Page 322

1. The perimeter of the base $= (4 \times 6)$ ft. $= 24$ ft.;
The convex surface $= \frac{1}{2}$ of (24×5) sq. ft. $= 60$ sq. ft.

2. The perimeter of the base $= 3\frac{1}{7} \times 5$ cm., or $15\frac{5}{7}$ cm.;
Since 3 dm. $= 30$ cm., the convex surface $= \frac{1}{2}$ of $(15\frac{5}{7} \times 30)$ sq. cm., or $235\frac{5}{7}$ sq. cm.

3. The perimeter of the base $= 3\frac{1}{7} \times 20$ ft. $= 62\frac{6}{7}$ ft.;
The convex surface $= \frac{1}{2}$ of $(20 \times 62\frac{6}{7})$ sq. ft. $= 628\frac{4}{7}$ sq. ft.

4. The perimeter of the base $= 8 \times 6$ ft., or 48 ft.;
The convex surface $= \frac{1}{2}$ of (80×48) sq. ft. $= 1920$ sq. ft., or $213\frac{1}{3}$ sq. yd.;
The cost of painting the steeple $= 213\frac{1}{3} \times \$.30$, or \$64.

5. The circumference of the base $= 3\frac{1}{7} \times 6$ ft., or $18\frac{6}{7}$ ft.;
The convex surface $= \frac{1}{2}$ of $(9\frac{1}{2} \times 18\frac{6}{7})$ sq. ft. $= 89\frac{4}{7}$ sq. ft.

6. The perimeter of the base $= 4 \times 10$ ft., or 40 ft.;
The convex surface $= \frac{1}{2}$ of (20×40) sq. ft. $= 400$ sq. ft.

7. The perimeter of the base $= 3\frac{1}{7} \times 8$ ft., or $25\frac{1}{7}$ ft.;
The convex surface $= \frac{1}{2}$ of $(6 \times 25\frac{1}{7})$ sq. ft. $= 75\frac{3}{7}$ sq. ft.

Page 323

1. The convex surface in square inches, $\pi d^2 = 3\frac{1}{7} \times 3^2$, or $28\frac{2}{7}$ sq. in.

2. The diameter $= 24$ cm.;
The convex surface, $\pi d^2 = (3\frac{1}{7} \times 24^2)$ sq. cm. $= 1810\frac{2}{7}$ sq. cm.

3. The convex surface, $\pi d^2 = (3\frac{1}{7} \times 8^2)$ sq. in. $= 201\frac{1}{7}$ sq. in.

4. 28 in. $= 2\frac{1}{3}$ ft.; the number of square feet in the convex surface, πd^2. $= 3\frac{1}{7} \times (2\frac{1}{3})^2$, or $17\frac{1}{9}$ sq. ft.
Hence, the cost of gilding the sphere $= 17\frac{1}{9} \times \$.12 = \$2.05\frac{1}{3}$, or \$2.06.

Page 324

1. The area of the base $= (5 \times 5)$ sq. in., or 25 sq. in.;
The volume of the prism $= (3 \times 25)$ cu. in., or 75 cu. in.

2. Since the radius is 4 dm., the area of the base, $\pi r^2 = (3\frac{1}{7} \times 4 \times 4)$ sq. dm. $= 50\frac{2}{7}$ sq. dm.;
2 m. $= 20$ dm.; hence, the volume $= (20 \times 50\frac{2}{7})$ cu. dm., or $1005\frac{5}{7}$ cu. dm.

3. The cubic contents of the bin $= (8 \times 8 \times 9)$ cu. ft. $= 576$ cu. ft.;
Since 1 bu. $= 1\frac{1}{4}$ cu. ft., the capacity of the bin in bushels $= 576 \div 1\frac{1}{4}$, or 460.8 bu.

4. The area of the base, $\pi r^2 = (3\frac{1}{7} \times \frac{7}{2} \times \frac{7}{2})$ sq. ft., or $38\frac{1}{2}$ sq. ft.;
The volume of the vat $= (8 \times 38\frac{1}{2})$ cu. ft., or 308 cu. ft.;
Since 1 cu. ft. $= 7\frac{1}{2}$ gal., the capacity of the vat $= 308 \times 7\frac{1}{2}$ gal., or 2310 gal.

5. The volume of the bin $= (15 \times 15 \times 12)$ cu. ft. $= 2700$ cu. ft.;
Since 1 bu. $= 1\frac{1}{4}$ cu. ft., the bin would hold as many bushels as $1\frac{1}{4}$ is contained times in 2700, or 2160 bu.;
The value of 2160 bu. of wheat $= 2160 \times \$.63$, or $\$1360.80$.

Page 325

1. The area of the base, $\pi r^2 = (3\frac{1}{7} \times 3 \times 3)$ sq. ft., or $\frac{198}{7}$ sq. ft.;
The volume of the cone $= \frac{1}{3}$ of $(9 \times \frac{198}{7})$ cu. ft. $= 84\frac{6}{7}$ cu. ft.

2. The area of the base $= (10 \times 10)$ sq. m., or 100 sq. m.;
The solid contents of the pyramid $= \frac{1}{3}$ of (20×100) cu. m., or $666\frac{2}{3}$ cu. m.

3. The area of the base, $\pi r^2 = (3\frac{1}{7} \times 3 \times 3)$ sq. ft., or $\frac{198}{7}$ sq. ft.;
The solid contents of the cone $= \frac{1}{3}$ of $(8 \times \frac{198}{7})$ cu. ft. $= \frac{528}{7}$ cu. ft.;
The weight of the cone $= \frac{528}{7} \times 165$ lb., or $12{,}445\frac{5}{7}$ lb.

4. The diameter $= 132$ ft. $\div 3\frac{1}{7}$, or 42 ft.; hence the radius is 21 ft.;
The area of the base, $\pi r^2 = (3\frac{1}{7} \times 21 \times 21)$ sq. ft. $= 1386$ sq. ft.;
The volume of the pile $= \frac{1}{3}$ of (30×1386) cu. ft. $= 13{,}860$ cu. ft.

Page 326

5. The volume, $\frac{1}{3}$ of altitude $\times$ base $= \frac{1}{3}$ of $(8 \times 4 \times 4)$ cu. ft. $= \frac{128}{3}$ cu. ft.;
The weight of the pyramid $= \frac{128}{3} \times 171$ lb., or 7296 lb.

6. The base of the pyramid $= (746 \times 746)$ sq. ft., or 556,516 sq. ft.;
The volume of the pyramid $= \frac{1}{3}$ of $(480 \times 556{,}516)$ cu. ft. $= 89{,}042{,}560$ cu. ft.

---

1. The volume, $\frac{4}{3}\pi r^3 = (\frac{4}{3} \times 3\frac{1}{7} \times 1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{2})$ cu. ft. $= 14\frac{1}{7}$ cu. ft.

2. The volume, $\frac{4}{3}\pi r^3 = (\frac{4}{3} \times 3\frac{1}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2})$ cu. cm. $= 4851$ cu. cm.

3. The diameter $= 22$ in. $\div 3\frac{1}{7}$, or 7 in.; hence, the radius is $\frac{7}{2}$ in.;
The volume, $\frac{4}{3}\pi r^3 = (\frac{4}{3} \times 3\frac{1}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2})$ cu. in. $= 179\frac{2}{3}$ cu. in.

4. Since the radius is 7 in., the cubic contents of the aquarium, $\frac{4}{3}\pi r^3 = (\frac{4}{3} \times 3\frac{1}{7} \times 7 \times 7 \times 7)$ cu. in. $= 1437\frac{1}{3}$ cu. in.

Since 1 gal. $= 231$ cu. in., the aquarium will hold as many gallons as 231 is contained times in $1437\frac{1}{3}$, or $6\frac{2}{9}$ gal.; at $8\frac{1}{3}$ lb. per gallon, $6\frac{2}{9}$ gal. of water weigh $\frac{56}{9} \times \frac{25}{3}$ lb. $= \frac{1400}{27}$ lb., or $51.9-$ lb.

5. The radius = 3 in., or $\frac{1}{4}$ ft.; hence, the volume of the cannon ball, $\frac{4}{3}\pi r^3 = (\frac{4}{3} \times \frac{22}{7} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4})$ cu. ft., or $\frac{11}{168}$ cu. ft.; this volume of water $= \frac{11}{168} \times 7\frac{1}{2}$ gal., or $\frac{55}{112}$ gal., which weighs $\frac{55}{112} \times 8\frac{1}{3}$ lb., or $\frac{1375}{336}$ lb.; but since iron weighs 7.21 times as much as water, the cannon ball weighs $7.21 \times \frac{1375}{336}$ lb. $= 29.505^+$ lb.

Page 328

1. Let x = the width of the 2d triangle in inches.

Then,
$$4 : 8 = 3 : x$$
$$4x = 24$$
$$x = 6$$

Hence, the 2d triangle is 6 in. wide.

2. The areas of the circles are proportional to the squares of the diameters; since the diameters are as 1 : 2, their squares are as $1^2 : 2^2$, or 1 : 4.

Let x = the area of the 2d circle in square inches.

Then,
$$5 : x = 1 : 4$$
$$x = 20$$

Hence, the area of the 2d circle is 20 sq. in.

3. The areas are proportional to the squares of the sides; but the areas are in the ratio of 1 to 4.

Let x = the side of the 2d square in inches.

Then,
$$1 : 4 = 5^2 : x^2$$
$$1 : 4 = 25 : x^2$$
$$x^2 = 100$$
$$x = 10$$

Hence, the side of the second square is 10 in.

4. Area of 1st : area of 2d : : $1^2 : 3^2$

Area of 1st : area of 2d = 1 : 9.

5. The area of the 1st blackboard = (3 × 3) sq. ft., or 9 sq. ft.

The areas are proportional to the squares of the sides;

Let x = the area of the 2d blackboard.

Then,
$$9 : x = 3^2 : 6^2$$
$$9 : x = 9 : 36$$
$$x = 36$$

Hence, the area of the 2d blackboard is 36 sq. ft.

6. Area of 1st : area of 2d = $4^2 : 16^2$

Area of 1st : area of 2d = 16 : 256

Area of 1st : area of 2d = 1 : 16.

7. The areas are proportional to the squares of the corresponding sides; but the areas are in the ratio of 1 to 25.

Let a = the 1st side of the 2d triangle in centimeters,
b = the 2d side of the 2d triangle in centimeters,
c = the 3d side of the 2d triangle in centimeters.

$$\begin{array}{lll}
1:25 = 1^2 : a^2 & 1:25 = 2^2 : b^2 & 1:25 = (\frac{5}{2})^2 : c^2 \\
a^2 = 25 & 1:25 = 4 : b^2 & 1:25 = \frac{25}{4} : c^2 \\
a = 5 & b^2 = 100 & c^2 = \frac{625}{4} \\
 & b = 10 & c = \frac{25}{2} = 12\frac{1}{2}
\end{array}$$

Therefore, the sides of the 2d triangle are 5 cm., 10 cm., and $12\frac{1}{2}$ cm.

8. The areas are proportional to the squares of the bases; but the areas are as 16 : 1.

Let a = base of 1st triangle, and b = base of 2d triangle.

Then, $16:1 = a^2:b^2$, or $\frac{16}{1} = \frac{a^2}{b^2}$

Extracting the square root, $\frac{4}{1} = \frac{a}{b}$

Therefore, the ratio of the bases is 4.

9. The corresponding sides of these triangles are proportional.

Let x = the number of feet in the height of the tree.

Then,
$$x:5 = 25:\tfrac{25}{4}$$
$$x:5 = 1:\tfrac{1}{4}$$
$$\tfrac{1}{4}x = 5$$
$$x = 20$$

Therefore, the height of the tree is 20 ft.

10. By the principle of similar figures, the height of the pole and that of the steeple are proportional to the lengths of their shadows.

Let x = the number of feet in the height of the steeple.

Then,
$$30:x = 60:300$$
$$30:x = 1:5$$
$$x = 150$$

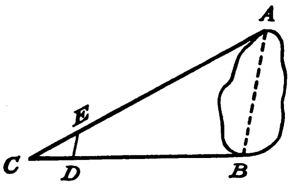
Hence, the height of the church steeple is 150 ft.

Page 329

12. By the principle of similar figures,
$$AB:ED = AC:EC$$

Then,
$$AB:50 = 2000:100$$
$$AB:50 = 20:1$$
$$AB = 50 \times 20 = 1000$$

Hence, the distance between A and B is 1000 ft.



Page 330

1. Edge of 1st prism : edge of 2d prism : : 6 : 12 or 9 : 18 or 18 : 36, or 1 : 2.

The volume of the 1st prism = (6 × 9 × 18) cu. ft. = 972 cu. ft.

Since the volumes of similar solids are proportional to the cubes of their corresponding lines, and since the corresponding lines of these solids are as 1 : 2,

vol. of 1st solid : vol. of 2d solid : : $1^3 : 2^3$

vol. of 1st solid : vol. of 2d solid : : 1 : 8

Hence, the volume of the 2d prism is 8 times that of the 1st.

The volume of the 2d prism = 8 × 972 cu. ft., or 7776 cu. ft.

By § 616 the volume of the 2d prism = (12 × 18 × 36) cu. ft. = 7776 cu. ft.

2. Radius of 1st cone : radius of 2d cone : : 4 : 12, or 1 : 3;

Altitude of 1st cone : altitude of 2d cone : : 8 : 24, or 1 : 3.

Since the volumes of similar solids are proportional to the cubes of their corresponding lines,

vol. of 1st cone : vol. of 2d cone : : $1^3 : 3^3$

vol. of 1st cone : vol. of 2d cone : : 1 : 27

Hence, the volume of the 2d cone is 27 times that of the 1st.

The base of the 1st cone, $\pi r^2 = (3\frac{1}{7} \times 4 \times 4)$ sq. ft. $= \frac{352}{7}$ sq. ft.;

The volume of the 1st cone $= \frac{1}{3}$ of $(8 \times \frac{352}{7})$ cu. ft. $= 134\frac{2}{21}$ cu. ft.

The volume of the 2d cone $= 27 \times 134\frac{2}{21}$ cu. ft., or $3620\frac{4}{7}$ cu. ft.

3. The volumes of the prisms are proportional to the cubes of their corresponding lines. Let x = the volume of the 2d prism in cubic inches.

Then,

$$30 : x = 5^3 : 10^3$$
$$30 : x = 125 : 1000$$
$$30 : x = 1 : 8$$
$$x = 240$$

Hence, the 2d prism will contain 240 cu. in.

4. The volumes of the two spheres are proportional to the cubes of their corresponding lines; but their diameters are as 2 : 1.

Let x = the number of cubic inches in the volume of the 2d sphere.

Then,

$$96 : x = 2^3 : 1^3$$
$$96 : x = 8 : 1$$
$$8x = 96$$
$$x = 12$$

Therefore, the volume of the 2d sphere is 12 cu. ft.

5. The volumes of the cones are proportional to the cubes of their corresponding dimensions; but the volumes are in the same ratio as their weights, or as 10 : 270. Let x = the number of feet in the altitude of the 2d cone.

(*Continued on next page.*)

Then,
$$10 : 270 = 2^3 : x^3$$
$$1 : 27 = 8 : x^3$$
$$x^3 = 27 \times 8$$
$$x = 3 \times 2, \text{ or } 6$$
Therefore, the altitude of the 2d cone is 6 ft.

6. Capacity of 2d bowl : capacity of 1st bowl : : $1.8^3 : 1.2^3$
Capacity of 2d bowl : capacity of 1st bowl $= 5.832 : 1.728$
Hence, the 2d bowl holds $5.832 \div 1.728$, or $3\frac{3}{8}$, times as much as the 1st bowl.

7. The volumes of the balls are proportional to the cubes of their diameters;
Their respective weights are in the same ratio as their volumes;
Their diameters are as 1 : 3.
Let x = the weight of the 2d ball in pounds.
Then,
$$10 : x = 1^3 : 3^3$$
$$10 : x = 1 : 27$$
$$x = 270$$
Therefore, the 2d ball weighs 270 lb.

8. Vol. of 1st column : vol. of 2d column : : $2^3 : 1^3$
$$728 : x = 8 : 1$$
$$8x = 728$$
$$x = 91$$
Hence, the volume of the 2d column will be 91 cu. dm.

9. The base of the 1st tank, $\pi r^2 = (\frac{22}{7} \times \frac{21}{2} \times \frac{21}{2})$ sq. ft., or $\frac{693}{2}$ sq. ft.;
The volume of the 1st tank $= (\frac{693}{2} \times 60)$ cu. ft., or 20,790 cu. ft.;
Since 1 cu. ft. $= 7\frac{1}{2}$ gal., the 1st tank can contain $20{,}790 \times 7\frac{1}{2}$ gal., or 155,925 gal.

Since the volumes of the tanks are proportional to the cubes of their altitudes, and since the ratio of the 2d altitude to the 1st is 40 : 60, or 2 : 3,
Capacity of 2d tank : capacity of 1st tank : : $2^3 : 3^3$
$$x : 155{,}925 = 8 : 27$$
$$27x = 155{,}925 \times 8$$
$$x = 5775 \times 8 = 46{,}200$$
Hence, the capacity of the 2d tank is 46,200 gal.

Therefore, the 1st tank can contain 155,925 gal. − 46,200 gal., or 109,725 gal., more than the 2d tank.

Page 331

1. The cost of 1 share, including brokerage $= \$106\frac{3}{4} + \$\frac{1}{8}$, or $\$106\frac{7}{8}$;
The cost of 60 shares $= 60 \times \$106\frac{7}{8} = \$6412.50$.

2. The total number of 100-dollar shares = $75,000 ÷ $100, or 750 shares; since Mr. Kirk had purchased 60 shares [Ex. 1], he owned $\frac{60}{750}$, or .08, or 8%, of the stock.

3. The number of dozen pairs ordered = 80 + 132 + 248 + 280 + 236 + 112, or 1088 doz. pairs.

4. The yarn for size 4 weighed 80 × 8 oz., or 640 oz.; for size 4½, 132 × 9 oz., or 1188 oz.; for size 5, 248 × 10½ oz., or 2604 oz.; for size 5½, 280 × 11¾ oz., or 3290 oz.; for size 6, 236 × 14 oz., or 3304 oz.; for size 6½, 112 × 15⅝ oz., or 1750 oz.; the total waste in making 1088 doz. pairs [Ex. 3, ans.] = 1088 × ½ oz., or 544 oz.

Hence, the total weight of yarn used = 640 oz. + 1188 oz. + 2604 oz. + 3290 oz. + 3304 oz. + 1750 oz. + 544 oz. = 13,320 oz., or 832½ lb.

5. The entire cost of the yarn per pound = $1.21½ + $.06½, or $1.28;

The total cost of the yarn = 832½ × $1.28, or $1065.60;

If $1065.60 was 62½%, or ⅝, of the total cost, the cost of the stockings = $1065.60 ÷ ⅝, or $1704.96.

6. 1088 doz. pr. at $1.90 per dozen would cost 1088 × $1.90, or $2067.20.

From Ex. 3, by the 2d offer, size 4 would cost 80 × $1.60, or $128; size 4½, 132 × $1.70, or $224.40; size 5, 248 × $1.80, or $446.40; size 5½, 280 × $1.90, or $532; size 6, 236 × $2, or $472; size 6½, 112 × $2.10, or $235.20.

Then the total cost by the 2d offer = $128 + $224.40 + $446.40 + $532 + $472 + $235.20 = $2038.00.

Therefore, the second was the better offer by $2067.20 − $2038, or $29.20. ✓

7. The net amount = $2038 − 5% of $2038 = $1936.10;

The mill gained $1936.10 − $1704.96, or $231.14.

$258.86

8. Since 1088 doz. pairs [Ex. 6] were made in 3⅖ da., the output of the mill per day = 1088 doz. pr. ÷ 3⅖, or 320 doz. pr.

Page 332

9. The number of days in August, less 4 Sundays, is 27;

27 × 320 doz. = 8640 doz., the output in the first case.

If there are 4 half-holidays, there are 25 whole days;

25 × 320 doz. = 8000 doz., the output in the second case.

10. If ¼ of 48, or 12, ribbers could make 810 doz. of sizes 4 or 4½ in 6 da., in 1 da. they could make ⅙ of 810 doz., or 135 doz.; then the daily capacity of a single machine on sizes 4 or 4½ = $\frac{1}{12}$ of 135 doz., or 11¼ doz.

If ½ of 48, or 24, ribbers could make 1392 doz. of sizes 5 or 5½ in 6 da., in 1 day they could make ⅙ of 1392 doz., or 232 doz.; then the daily capacity of a single machine on sizes 5 or 5½ = $\frac{1}{24}$ of 232 doz., or 9⅔ doz.

(*Continued on next page.*)

If the rest, 12 ribbers, could make 612 doz. of sizes 6 or $6\frac{1}{2}$ in 6 da., in 1 da. they could make $\frac{1}{6}$ of 612 doz., or 102 doz.; then the daily capacity of a single machine on sizes 6 or $6\frac{1}{2} = \frac{1}{12}$ of 102 doz., or $8\frac{1}{2}$ doz.

11. The total amount of yarn for 100 doz. pr. = 100 × $8\frac{1}{2}$ oz. = 850 oz., or $53\frac{1}{8}$ lb.;

Then the woman wound $53\frac{1}{8}$ lb. + $2\frac{7}{8}$ lb., or 56 lb.

12. She received 56 × \$.02$\frac{1}{2}$, or \$1.40.

13. 330 doz. ÷ 45 = $7\frac{1}{3}$ doz., the quantity footed by each girl;
\$59.40 ÷ 330 = \$.18, the price for footing one dozen;
$7\frac{1}{3}$ × \$.18 = \$1.32, the sum each earned per day.

14. 20% of 365 da. = 73 da.; 73 da. − 8 da. = 65 da.;
Hence, she worked 365 da. − 65 da., or 300 da., in a year;
104 × \$.01$\frac{3}{8}$ = \$1.43, her wages per day;
300 × \$1.43 = \$429, her wages for a year.

15. $1\frac{2}{5}$% of \$45,000 = \$630, the premium.

16. By adding the numbers under each figure denoting the size, we find the quantity of each size sold to be: 4's, 7472 doz.; $4\frac{1}{2}$'s, 12,160 doz.; 5's, 17,648 doz.; $5\frac{1}{2}$'s, 16,208 doz.; 6's, 11,688 doz.; $6\frac{1}{2}$'s, 5632 doz.

By adding the horizontal rows the number of dozens of each kind is: white, 20,784 doz.; black, 36,408 doz.; colored, 13,616 doz.

The total number = 20,784 doz. + 36,408 doz. + 13,616 doz. = 70,808 doz.

Page 333

17. The yarn for size 4 weighed 4256 × 8 oz., or 34,048 oz.; size $4\frac{1}{2}$, 5248 × 9 oz., or 47,232 oz.; size 5, 4912 × $10\frac{1}{2}$ oz., or 51,576 oz.; size $5\frac{1}{2}$, 4032 × $11\frac{3}{4}$ oz., or 47,376 oz.; size 6, 1312 × 14 oz., or 18,368 oz.; size $6\frac{1}{2}$, 1024 × $15\frac{5}{8}$ oz., or 16,000 oz.; the total waste in making 20,784 doz. pr. [Ex. 16, ans.] = 20,784 × $\frac{1}{2}$ oz., or 10,392 oz.

Hence, the total weight of yarn for white hose = 34,048 oz. + 47,232 oz. + 51,576 oz. + 47,376 oz. + 18,368 oz. + 16,000 oz. + 10,392 oz. = 224,992 oz., or 14,062 lb.

18. 14,062 lb. was 100% of the total amount less $1\frac{1}{4}$% of itself, or $98\frac{3}{4}$% of the total amount; hence, the quantity of yarn purchased for white hose = 14,062 lb. ÷ .9875, or 14,240 lb.

19. At \$1.25 per pound, the total cost = 14,240 × \$1.25, or \$17,800.

20. Referring to Ex. 16 and 4, the yarn in the black and the colored hose weighed as follows: size 4, 3216 doz. pr., 3216 × 8 oz., or 25,728 oz.; size $4\frac{1}{2}$, 6912 doz. pr., 6912 × 9 oz., or 62,208 oz.; size 5, 12,736 doz. pr., 12,736 × $10\frac{1}{2}$ oz., or 133,728 oz.; size $5\frac{1}{2}$, 12,176 doz. pr., 12,176 × $11\frac{3}{4}$ oz., or 143,068 oz.;

size 6, 10,376 doz. pr., 10,376 × 14 oz., or 145,264 oz.; size 6½, 4608 doz. pr., 4608 × 15⅝ oz., or 72,000 oz.; and since the total number of black and colored hose = 3216 doz. + 6912 doz. + 12,736 doz. + 12,176 doz. + 10,376 doz. + 4608 doz. = 50,024 doz., the waste = 50,024 × ½ oz., or 25,012 oz.

Hence, the total weight of yarn for black and colored hose = 25,728 oz. + 62,208 oz. + 133,728 oz. + 143,068 oz. + 145,264 oz. + 72,000 oz. + 25,012 oz. = 607,008 oz., or 37,938 lb.

21. At $1.27½ per pound, the total cost = 37,938 × $1.27½, or $48,370.95.

22. From Ex. 19 and 21, ans., the cost of materials for all hose sold = $17,800 + $48,370.95, or $66,170.95.

23. The cost of boxes per doz. pr. of stockings = 2 × 1½¢ = 3¢;
The entire cost of both items per doz. pr. = 35¢ + 3¢, or 38¢;
The cost for the 70,808 doz. = 70,808 × $.38, or $26,907.04;
$26,907.04 + $66,170.95 = $93,077.99.

24. Since $93,077.99 − $915.21, or $92,162.78, was 85% of the entire expenses, the total expenses = $92,162.78 ÷ .85, or $108,426.80.

25. 70,808 doz. pr. was the entire number sold [Ex. 23];
70,808 × $1.90 = $134,535.20, the gross amount;
5% of $134,535.20 = $6726.76, the discount;
$134,535.20 − $6726.76 = $127,808.44, the net receipts.

26. The amount of waste occasioned in the manufacture of 70,808 doz. pr. of hose [Ex. 23] = 70,808 × ½ oz. = 35,404 oz., or 2212¾ lb.;
2212¾ × $.12 = $265.53, the value of the waste.

27. $128,073.97 − $108,426.80 = $19,647.17, the gain;
$19,647.17 ÷ $108,426.80 = .181+; that is, the gain was 18.1% of the cost.

Page 334

28. $19,647.17 − $1647.17 = $18,000, the total dividend;
$18,000 ÷ $75,000 = .24; that is, the dividend was 24% of the capital.

29. The amount of dividend [see Ex. 28, ans.] = 24% of $6000 = $1440.

30. He paid, including brokerage, $106¾ + $⅛, or $106⅞, per share;
His profit per share [see Ex. 28, ans.] = 24% of $100, or $24;
$24 ÷ $106.875 = .225−; that is, his profit was 22.5%.

31. ⅙ of 51 M. = 8½ M., the amount received per day;
⅒ of 8.5 M. = .85 M., or 85 pf., the amount received per hour.

32. A man earns 7½*d.* − 5*d.*, or 2½*d.*, more in 1 da.;
He earns 20 × 2½*d.*, or 50*d.*, or 4*s.* 2*d.*, more in 20 da.

33. 31*s.* = £$\frac{31}{20}$, or £1.55 = 1.55 × $4.8665, or $7.543075; hence, the American laborer was better paid by $11.679 − $7.543075, or $4.136−.

34. 14*s*. = £$\frac{14}{20}$, or £.7 = .7 × $4.8665, or $3.40655; hence, the American expended $3.893 – $3.40655, or $.486+, more.

Since the English laborer received 31*s*. [Ex. 33], he expended $\frac{14}{31}$ of his wages for food.

Since the American laborer received $11.679 [Ex. 33], he expended $\frac{3.893}{11.679}$, or $\frac{1}{3}$, of his wages for food.

35. $\begin{array}{r|l} 12 & 11180d. \\ \hline 20 & \ \ 931.66^{+}s. \\ \hline & £46.583^{+} \end{array}$

260 × 43*d*. = 11,180*d*., his yearly wage;
11,180*d*. = £46.583+ = 46.583 × $4.8665
= $226.6961695, or $226.70–.

36. The area of the front = (22 × 24) sq. ft. = 528 sq. ft.;
The area of back and front = 2 × 528 sq. ft., or 1056 sq. ft.;
The area of one side = (32 × 24) sq. ft. = 768 sq. ft.;
The area of both sides = 2 × 768 sq. ft., or 1536 sq. ft.;
The entire area = 1056 sq. ft. + 1536 sq. ft., or 2592 sq. ft. = 288 sq. yd.;
The cost = 288 × $.30, or $86.40.

37. One dimension of the block is just the length of a strip.

The width of the block, 10½ in., will permit as many 3½-inch widths of strip in one layer as 3½ is contained times in 10½, or 3 strips.

The thickness of the block, 2¼ in., will permit as many layers $\frac{3}{16}$ in. thick as $\frac{3}{16}$ is contained times in 2¼, or 12 layers.

Hence, the total number of strips = 12 × 3, or 36 strips; but each strip makes the halves of 6 pencils, or 3 whole pencils; therefore, 36 × 3 pencils, or 108 pencils, can be made from the block of cedar.

Page 335

38. 1 A. = 43,560 sq. ft.; hence, 5½ A. = 5½ × 43,560 sq. ft., or 239,580 sq. ft.

39. 310 × 225 cords = 69,750 cords, the quantity of wood.
310 × 200 T. = 62,000 T., the quantity of paper.

40. 125 in. = $\frac{125}{12}$ ft.; since the machine turns out (500 × $\frac{125}{12}$) sq. ft. of paper per minute, in 60 min. it turns out 60 × (500 × $\frac{125}{12}$) sq. ft., or 312,500 sq. ft.

41. As many trees were necessary as 500 lb. is contained times in 2,000,000 lb., or 4000 trees.

42. .776 of 1,233,150,000 lb. = 956,924,400 lb., for newspapers.
.164 of 1,233,150,000 lb. = 202,236,600 lb., for books and periodicals.
77.6% + 16.4% = 94%; 100% – 94% = 6%, the remainder;
.06 of 1,233,150,000 lb. = 73,989,000 lb., in job printing.

43. 76,303,387 × $1.66 = $126,663,622.42, the total value.

44. $43,875,000 ÷ $97,500,000 = .45; that is, the dividend was 45%.

45. .0375 of $25,000,000 = $937,500, the dividend paid.

46. 3 × $87 = $261; $95 + $261 = $356, his sales;
15% of $356 = $53.40, his commission;
$10 + $53.40 = $63.40, his earnings for one week.

47. 4,285,103.40 × $1.47 ≐ $6,299,101.998, or $6,299,102, amount collected.

Page 336

48. His commission for the entire period = 2½% + 7%, or 9½%, of $1800 = $171.

49. Since 7½% of the whole amount was $220.50, the amount for which he sold the rice = $220.50 ÷ .075, or $2940.

$2940.00 ÷ 56,000 = $.05¼, or 5¼¢, the price per pound.

50. 100% − 60%, or 40%, of $85 = $34, amount after 1st discount;
$34 − 10% of $34 = $30.60, the net cost of the tools.

51. 2 × 12 boxes = 24 boxes; 24 × 6 lb. = 144 lb.; 144 × 4 tins = 576 tins; 576 × $.13 = $74.88, the total amount received; $74.88 − $57.60 = $17.28, the total gain.

$17.28 ÷ $57.60 = .30; hence, the gain was 30%.

4 × $.13 = $.52, the selling price per pound; but $.52 is equal to the cost plus 30% of itself; that is, it is 130%, or 13/10, of the cost; then the cost per pound = $.52 ÷ 13/10, or $.40, and the gain = $.52 − $.40 = $.12, or 12¢.

52. 1 bbl. flour cost $3.85; 20 lb. butter cost 20 × $.26, or $5.20; 16 lb. lard cost 16 × $.11½, or $1.84; 64 lb. powdered sugar cost 64 × $.07¾, or $4.96; 3½ gal., or 14 qt., milk cost 14 × $.06, or $.84; 2 qt. glycerine cost 2 × $.75, or $1.50; 10 oz., or ⅝ lb., soda cost ⅝ × $.08, or $.05; ammonia, etc. cost $.96; 2 gal., or 16 pt., eggs are equivalent to 160 eggs, or 13⅓ doz. eggs, which cost 13⅓ × $.24, or $3.20.

The total cost = $3.85 + $5.20 + $1.84 + $4.96 + $.84 + $1.50 + $.05 + $.96 + $3.20 = $22.40.

252 × $.16 = $40.32, the amount received.

$40.32 − $22.40 = $17.92, the gain.

$17.92 ÷ $22.40 = .80; hence, the gain was 80% of the cost.

$3.20 ÷ $22.40 = ⅐; that is, cost of eggs was ⅐ of total cost.

53. 21 × 34 2/7 T. = 720 T., the entire weight of the engine.

54. In 2 min. 31 sec., or 151 sec., 151 × 1100 images, or 166,100 images, can be obtained.

55. Since 6 × 28, or 168, is 22 less than the number of beats per second made by a bee's wings, a bee's wings make 168 + 22, or 190, beats per second.

Since 190 + 8, or 198, is ⅗ of the number of beats per second made by a house fly's wings, a house fly's wings make 198 ÷ ⅗, or 330, beats per second.

Page 337

56. 4500 m. $- 33\frac{1}{3}\%$ of 4500 m. $= 4500$ m. $- 1500$ m., or 3000 m., the distance; 25 cm. $+ 20\%$ of 25 cm. $= 25$ cm. $+ 5$ cm., or 30 cm., the depth penetrated.

57. $4 \times 2 \times 15 = 120$, the number of shots fired by 4 cannon in $\frac{1}{4}$ hr.;
$\$48{,}000 \div 120 = \$400$, the cost of each shot.

58.
$$\begin{array}{r|l} 12 & 117d. \\ \hline 20 & 9.75s. \\ \hline & \pounds.4875 \end{array}$$

$18 \times 6\frac{1}{2}d. = 117d.$, the total charges;
$117d. = \pounds.4875 = .4875 \times \$4.8665 = \$2.37241875$,
or $\$2.37^{+}$.

59.
$$\begin{array}{rr} \pounds 96 & 10s. \\ & 15 \\ \hline \pounds 1447 & 10s. \end{array}$$

The cost for 15 yr. $= \pounds 1447\ 10s.$, or $\pounds 1447.5 = 1447.5 \times \$4.8665 = \$7044.25875$, or $\$7044.26^{-}$.

60. For metric equivalents, see p. 345 of text.

41 m. 46 cm., or 41.46 m. $= 41.46 \times 39.37$ in., or 1632.2802 in. $=$ 136 ft. $.28^{+}$ in., or 136 ft. $\frac{1}{4}$ in.

19 m. $92\frac{1}{2}$ cm., or 19.925 m. $= 19.925 \times 39.37$ in., or 784.44725 in. $=$ 65 ft. 4.45^{-} in., or 65 ft. $4\frac{1}{2}$ in.

7 m. 20 cm., or 7.2 m. $= 7.2 \times 39.37$ in., or 283.464 in. $=$ 23 ft. 7.464 in., or 23 ft. $7\frac{1}{2}$ in.

76.55 Kg. $= 76.55 \times 2.2046$ lb. $= 168.762130$ lb., or 169 lb.
100 m. $= 100 \times 39.37$ in., or 3937 in. $=$ 109 yd. 1 ft. 1 in.; then,
109 yd. 1 ft. 1 in. $-$ 100 yd. $=$ 9 yd. 1 ft. 1 in., excess of 100 m. over 100 yd.
1500 m. $= 1500 \times 39.37$ in., or 59,055 in. $= 4921\frac{1}{4}$ ft.; hence,
1500 m. is 5280 ft. $-$ 4921.25 ft., or 358.75 ft., less than 1 mi.
400 m. $= 400 \times 39.37$ in., or 15,748 in. $= 1312\frac{1}{3}$ ft.; $\frac{1}{4}$ mi. $=$ 1320 ft.; hence,
400 m. is 1320 ft. $- 1312\frac{1}{3}$ ft., or $7\frac{2}{3}$ ft., less than $\frac{1}{4}$ mi.

Page 338

61. 25,000,000 gal. $\div$ 455,000 $= 54.9^{+}$, or 55^{-}, gal., the supply per person.

62. 19,200 M. $\div$ 1200 $=$ 16 M., the average fare;
$16 \times \$.238 = \$3.808$, or $\$3.81^{-}$, the average fare in our money.

63. At 60 M. per 1000 Km., first class, the price per kilometer is .06 M., or 6 pf.;
1 mi. $= 1.60935$ Km.; then, the price per mile in pfennigs $= 1.60935 \times 6$ pf. $= 9.65610$ pf., or 10^{-} pf.; also, 9.65610 pf., or .096561 M. $= .096561 \times \$.238 = \$.022981518$, or 2.3^{-}¢, the price per mile in cents.

At 40 M. per 1000 Km., second class, the price is $\frac{2}{3}$ of that at 60 M.;
$\frac{2}{3}$ of 9.6561 pf. $= 6.4374$ pf., or 6^{+} pf., the price per mile.
$\frac{2}{3}$ of $\$.02298^{+} = \$.0153^{+}$, or 1.5^{+}¢, the price per mile.
At 25 M. per 1000 Km., third class, the price is $\frac{5}{8}$ of that at 40 M.;
$\frac{5}{8}$ of 6.4374 pf. $= 4.023^{+}$ pf., or 4^{+} pf., the price per mile.
$\frac{5}{8}$ of $\$.0153^{+} = \$.0096^{-}$, or 1^{-}¢, the price per mile.

64. (2 × 5¢) + $6\frac{1}{2}$¢ = $16\frac{1}{2}$¢, the cost per day;
$6 \times 16\frac{1}{2}$¢ = 99¢, the cost for 6 days' board;
Since 1 M. = \$.238, \$.99 is equal to as many marks as \$.238 is contained times in \$.99, or 4.159+ M., or 4 M. 16− pf.

65. 83% of 10,622 mi. = 8816.26 mi., government railway.

66. $633\frac{3}{4}$ T. = 1,267,500 lb.; since 650 lb. make 1 mi., the number of miles in 1,267,500 lb. of copper conductor = 1,267,500 ÷ 650, or 1950 mi.

67. Since a difference of 15° in longitude corresponds to a difference of 1 hr. in time, the difference in time between Washington and London, which are 75° apart, is $\frac{1}{15}$ of 75, or 5, hr. Since London is *east* of Washington, the time is *later* in London; hence, when it is 2:33 P.M. in Washington it is 5 hr. later than that in London, or 7:33 P.M. Then the message was received at 33 min. $6\frac{3}{4}$ sec. after 7 P.M.

68. 230 ft. = $76\frac{2}{3}$ yd.; since 1 yd. = .9144 m., $76\frac{2}{3}$ yd. = $76\frac{2}{3} \times .9144$ m., or 70.104 m., the height.

69. 21 camel loads = 21 × $4\frac{1}{2}$ Q., or $94\frac{1}{2}$ Q.;
$94\frac{1}{2}$ × \$4.34 = \$410.13, the cost.

70. 40 m. = 40 × 39.37 in., or 1574.8 in. = 131 ft. 2.8 in.
630 mm., or .63 m. = .63 × 39.37 in., or 24.8031 in. = 2 ft. .803+ in.
7 m. = 7 × 39.37 in., or 275.59 in. = 22 ft. 11.59 in.

71. 28° C. = 28 × $\frac{9}{5}$° F. + 32° F. = $82\frac{2}{5}$° F.

Page 339

72. The period without interest was 1 yr. plus 26 mo., or 3 yr. 2 mo.
$2\frac{3}{4}$% of £2,600,000 = £71,500, int. for 1 yr.
3 × £71,500 = £214,500, int. for 3 yr.
$\frac{1}{6}$ of int. for 1 yr. = 11,916$\frac{2}{3}$, int. for 2 mo.
£226,416$\frac{2}{3}$, int. for 3 yr. 2 mo.
Therefore, the value of the use of the money was £226,416$\frac{2}{3}$.

73. The principal [see Ex. 72] after the 10th payment = $\frac{1}{2}$ of £2,600,000, or £1,300,000;
$2\frac{3}{4}$% of £1,300,000 = £35,750, the interest for 1 year.

74. The price per trip = \$690,483.20 ÷ 47, or \$14,691.13+;
The number of miles = \$14,691.13+ ÷ \$4, or 3672.8− mi.

75. At 5¢ per $\frac{1}{2}$ oz. the price per pound = 2 × 16 × \$.05, or \$1.60;
The cost for first-class mail = 350,180 × \$1.60, or \$561,296.00;
At 1¢ per 2 oz. the price per pound = \$.08;
The cost for other mail = 2,384,406 × \$.08, or \$190,752.48;

(*Continued on next page.*)

The total cost = $561,296.00 + $190,752.48 = $752,048.48;

Since the contract price was $690,483.20 [Ex. 74], the amount saved = $752,048.48 − $690,483.20, or $61,565.28.

76. Since 165,148,403 g. was 29% of all the first-class transatlantic mail, the whole amount = 165,148,403 g. ÷ .29 = 569,477,252⁻ g., or 569,477.252⁻ Kg.

77. 4% + 8% + 3¾%, or 15¾%, of $800 = $126, interest, depreciation, and repairs;

$126 + $4 = $130, the annual cost.

78. 12 × $19 = $228, the annual income.

The car costs $800 [Ex. 77]; $228 ÷ $800 = .28½; hence, the income is 28½% of the cost of the car.

79. The number of tons of ice = $23 ÷ $2.50, or 9.2 T.

$23.00 ÷ 923 = $.0249+, or $.025, the cost of icing per mile.

Page 340

80. $47,727,412 ÷ $110,500,000 = .4319+; hence, the profits were 43.19% of the capital.

81. 100,000 × $.72 = $72,000, the value of the wheat;

1¾% − ⅝%, or 1⅛%, of $72,000 = $810, the difference in the premiums.

82. The value of the gold per pound = 16 × $26.87, or $429.92;

The number of pounds = $1,000,000 ÷ $429.92, or 2326+ lb.;

The premium = 23.26+ × $.25 = $5.815+, or $5.82.

83. 1¼% of $80,000 = $1000, the premium.

84. Referring to Ex. 83, the premium on the British vessel = $1000 − $200, or $800; $800 ÷ $80,000 = .01; hence, the rate is 1%.

85. 3750 × 60 Kg. = 225,000 Kg., the weight;

225,000 × $.16 = $36,000, the value;

$\frac{7}{16}$% of $36,000 = $157.50, the premium.

86. The number of tons = 25,000 cu. ft. ÷ 40 cu. ft., or 625 T.;

The cost of shipping = 625 × $6.87, or $4293.75.

87. 29 × $4.13 = $119.77, the charges for the *Deutschland.*

88. 24,000 × $.83 = $19,920, the sum paid at purchase;

40% of $19,920 = $7968, the ad valorem duty;

27 in. = ¾ yd.; (2400 × ¾) sq. yd. = 18,000 sq. yd., the total area;

18,000 × $.28 = $5040, the specific duty;

$19,920 + $7968 + $5040 = $32,928, the total cost.

Page 341

89. The total area = 9 × ($8\frac{1}{2}$ × 11) sq. ft. = $841\frac{1}{2}$ sq. ft.;
$841\frac{1}{2}$ × \$.30 = \$252.45, the duty.

90. \$38,403,761.18 ÷ \$2,016,947,622 = .01904+; hence, the rate per dollar was \$.01904, or 19.04 mills.

91. 40% of \$250,000 = \$100,000, the assessed valuation;
At 19.04 mills per dollar [Ex. 90, ans.], the man's tax = 100,000 × \$.01904, or \$1904.

92. 4500.00 × .8$\frac{4}{45}$ M. = 3640 M., the amount in marks;
3640 M. = 3640 × \$.238, or \$866.32, the tax in U. S. money.

93. The tax = 2% of \$163,180, or \$3263.60.

94. 10 mi., or 52,800 ft., per hour = $\frac{1}{60}$ of 52,800 ft., or 880 ft., per minute;
Speed of elevators: speed of cars : : 700 ft. : 880 ft.
Speed of elevators : speed of cars = 700 : 880 = 35 : 44.

95. Since \$20 in gold coin weighs $21\frac{1}{2}$ pwt., \$1 weighs $21\frac{1}{2}$ pwt. ÷ 20, or 1.075 pwt.; then the value of an ingot weighing 72 oz., or 1440 pwt., is as many dollars as 1.075 pwt. is contained times in 1440 pwt., or \$1339.535⁻.

96. Since 1 double eagle weighs $21\frac{1}{2}$ pwt. [Ex. 95], 65 double eagles weigh 65 × $21\frac{1}{2}$ pwt., or $1397\frac{1}{2}$ pwt. = $69\frac{7}{8}$ oz.; then 72 oz. − $69\frac{7}{8}$ oz., or $2\frac{1}{8}$ oz., are recast from each ingot.

97. The value per pound = 16 × \$.0064$\frac{1}{4}$, or \$.1028; then the number of pounds sold = \$14,257 ÷ \$.1028, or 138,686.77+ lb.

98. 12 × $26\frac{3}{8}$ *d.* = $316\frac{1}{2}$ *d.*, the value per pound;
25 × $316\frac{1}{2}$ *d.* = $7912\frac{1}{2}$ *d.*, the total value;
$7912\frac{1}{2}$ *d.*, or £32.96875 = 32.96875 × \$4.8665 = \$160.442421875, or \$160.442+.

12	7912.5 *d.*
20	659.375 *s.*
	£32.96875

99. $687\frac{1}{2}$ lb. (troy) = $687\frac{1}{2}$ × 5760 gr. = 3,960,000 gr.;
3,960,000 gr. ÷ 9600 = $412\frac{1}{2}$ gr., the weight of each dollar.

344

Page 342

100. The difference in longitude between New York (75° W.) and San Francisco (120° W.) is 45°, corresponding to a time difference of 3 hr. Since New York is *east* of San Francisco, the time is *later* in New York. Hence, when it was 5:13 A.M. in San Francisco it was 3 hr. later than that in New York, or 8:13 A.M. Therefore the receipt of the telegram in New York at 9:15 A.M. was 1 hr. 2 min. after the event.

101. At \$5 per £10,000, the brokerage on £3500 = .3500 × \$5, or \$1.75.

102. His commission = $\frac{1}{64}$% of 48,000 M., or $7\frac{1}{2}$ M. = $7\frac{1}{2}$ × \$.238, or \$1.78$\frac{1}{2}$.

103. The gain $= .0861 \times \$196{,}532{,}866 = \$16{,}921{,}479.7626$, or $\$16{,}921{,}479.76+$.

104. Since the cost of the bonds, including brokerage, is $102\frac{5}{8}\% + \frac{1}{8}\%$, or $102\frac{3}{4}\%$, of the par value, the total par value of bonds costing $\$35{,}962.50 = \$35{,}962.50 \div 1.02\frac{3}{4}$, or $35,000. Therefore, the annual income $= 3\%$ of $35,000, or $1050.

105. Since the annual income, $4\frac{1}{2}\%$ of the par value, is to be $1350, the par value $= \$1350 \div .045$, or $30,000.

At $91\frac{5}{8}$, the cost, including brokerage, will be $91\frac{5}{8}\% + \frac{1}{8}\%$, or $91\frac{3}{4}\%$, of the par value. Therefore $91\frac{3}{4}\%$ of $30,000, or $27,525, must be invested to yield $1350 annually.

106. The number of bonds $= \$3{,}125{,}000 \div \$1000$, or 3125 bonds;
The premium per bond $= \$45{,}877 \div 3125$, or $\$14.68+$;
The selling price per bond was therefore $1014.68.

107. $112\frac{1}{7}\%$ of $\$3{,}555{,}000 = \$3{,}986{,}678.57\frac{1}{7}$, the entire sale.

108. Referring to § 626,

$$\text{Height of man} : \text{height of tree} :: \left\{\begin{matrix}\text{length of man's}\\ \text{shadow}\end{matrix}\right\} : \left\{\begin{matrix}\text{length of tree's}\\ \text{shadow}\end{matrix}\right\}$$

$$6 : x = 4\tfrac{1}{2} : 54$$
$$4\tfrac{1}{2}x = 6 \times 54$$
$$x = 6 \times 12 = 72$$

Therefore, the tree was 72 ft. in height.

109. Referring to § 626,

$$\text{Height of pencil} : \text{height of tree} :: \left\{\begin{matrix}\text{dist. of pencil}\\ \text{from eye}\end{matrix}\right\} : \left\{\begin{matrix}\text{dist. of tree}\\ \text{from eye}\end{matrix}\right\}$$

$$\tfrac{1}{3}\text{ ft.} : 45\text{ ft.} = 3\text{ ft.} : x\text{ ft.}$$
$$\tfrac{1}{3} : 45 = 3 : x$$
$$\tfrac{1}{3}x = 45 \times 3$$
$$x = 405$$

Therefore, the tree is 405 ft. in height.

110. The weight of the balloon in grains $= 1674 \times 7000$ gr., or 11,718,000 gr.

Every 100 cu. in. of gas introduced weighs $\frac{1}{3}$ of 31 gr.; but for this amount of gas 31 gr. of air are displaced; hence, every 100 cu. in. of gas brings the weight of the air displaced $\frac{2}{3}$ of 31 gr., or $\frac{62}{3}$ gr., nearer the weight of balloon and gas combined. Consequently, to support the balloon, as many times 100 cu. in. of gas must be used as $\frac{62}{3}$ gr. is contained times in 11,718,000 gr., that is, $567{,}000 \times 100$ cu. in., or 56,700,000 cu. in. $= (56{,}700{,}000 \div 1728)$ cu. ft., or $32{,}812\frac{1}{2}$ cu. ft.

KEY

TO

COMPLETE BOOK

NOTE. — *References are to pages in the Key.*

Page 16

12–19. See Ex. 12–19, p. 3.

Page 17

20. See Ex. 20, p. 3. **21–23.** See Ex. 21–23, p. 4.

24. Cost of coal = 35 × $3.60 = $126.

25–27. See Ex. 25–27, p. 4.

28. Total cost = $270 + $297 + $126 + $6.03 + $.76 + $121.50 = $821.29.

29–30. See Ex. 29–30, p. 4.

Page 43

1. Number of words @ 4¢ = 22 − 10 = 12 ; 12 × 4¢ = 48¢ ; cost = 60¢ + 48¢ = $1.08.

2. Number of words @ 3¢ = 22 − 10 = 12 ; 12 × 3¢ = 36¢ ; cost = 50¢ + 36¢ = 86¢.

3. The telegram at night costs $1.08 − $.86, or $.22, less.

4. Number of words @ 3¢ = 15 − 10 = 5 ; 5 × 3¢ = 15¢ ; cost at night rate = 50¢ + 15¢ = 65¢.

Number of words @ 4¢ = 15 − 10 = 5 ; 5 × 4¢ = 20¢ ; cost at day rate = 60¢ + 20¢ = 80¢.

The telegram at night costs 80¢ − 65¢, or 15¢, less.

5. Number of words @ 2¢ = 16 − 10 = 6 ; 6 × 2¢ = 12¢ ; cost = 25¢ + 12¢ = 37¢.

Number of words @ 1¢ = 16 − 10 = 6 ; 6 × 1¢ = 6¢ ; cost = 25¢ + 6¢ = 31¢.

6. Number of words @ 2¢ = 18 – 10 = 8; 8 × 2¢ = 16¢; cost = 30¢ + 16¢ = 46¢.

Number of words @ 1¢ = 18 – 10 = 8; 8 × 1¢ = 8¢; cost = 25¢ + 8¢ = 33¢.

7. Number of words @ 3¢ = 22 – 10 = 12; 12 × 3¢ = 36¢; cost = 40¢ + 36¢ = 76¢.

Number of words @ 2¢ = 22 – 10 = 12; 12 × 2¢ = 24¢; cost = 30¢ + 24¢ = 54¢.

8. Number of words @ 2¢ = 24 – 10 = 14; 14 × 2¢ = 28¢; cost = 25¢ + 28¢ = 53¢.

Number of words @ 1¢ = 24 – 10 = 14; 14 × 1¢ = 14¢; cost = 25¢ + 14¢ = 39¢.

9. Number of words @ 2¢ = 26 – 10 = 16; 16 × 2¢ = 32¢; cost = 30¢ + 32¢ = 62¢.

Number of words @ 1¢ = 26 – 10 = 16; 16 × 1¢ = 16¢; cost = 25¢ + 16¢ = 41¢.

10. Number of words @ 3¢ = 17 – 10 = 7; 7 × 3¢ = 21¢; cost = 40¢ + 21¢ = 61¢.

Number of words @ 2¢ = 17 – 10 = 7; 7 × 2¢ = 14¢; cost = 30¢ + 14¢ = 44¢.

11. Number of words @ 3¢ = 19 – 10 = 9; 9 × 3¢ = 27¢; cost = 40¢ + 27¢ = 67¢.

Number of words @ 2¢ = 19 – 10 = 9; 9 × 2¢ = 18¢; cost = 30¢ + 18¢ = 48¢.

12. Number of words @ 3¢ = 20 – 10 = 10; 10 × 3¢ = 30¢; cost = 40¢ + 30¢ = 70¢.

Number of words @ 2¢ = 20 – 10 = 10; 10 × 2¢ = 20¢; cost = 30¢ + 20¢ = 50¢.

13. Number of words @ 3¢ = 23 – 10 = 13; 13 × 3¢ = 39¢; cost = 50¢ + 39¢ = 89¢.

Number of words @ 3¢ = 23 – 10 = 13; 13 × 3¢ = 39¢; cost = 40¢ + 39¢ = 79¢.

14. Number of words @ 3¢ = 25 – 10 = 15; 15 × 3¢ = 45¢; cost = 50¢ + 45¢ = 95¢.

Number of words @ 3¢ = 25 – 10 = 15; 15 × 3¢ = 45¢; cost = 40¢ + 45¢ = 85¢.

15. Number of words @ 3¢ = 30 – 10 = 20; 20 × 3¢ = 60¢; cost = 40¢ + 60¢ = $1.

Number of words @ 2¢ = 30 – 10 = 20; 20 × 2¢ = 40¢; cost = 30¢ + 40¢ = 70¢.

16. Number of words @ $3¢ = 32 - 10 = 22$; $22 \times 3¢ = 66¢$; cost $= 50¢ + 66¢ = \$1.16$.

Number of words @ $3¢ = 32 - 10 = 22$; $22 \times 3¢ = 66¢$; cost $= 40¢ + 66¢ = \$1.06$.

17. Number of words @ $4¢ = 18 - 10 = 8$; $8 \times 4¢ = 32¢$; cost $= 60¢ + 32¢ = 92¢$.

Number of words @ $3¢ = 18 - 10 = 8$; $8 \times 3¢ = 24¢$; cost $= 50¢ + 24¢ = 74¢$.

18. Number of words @ $4¢ = 25 - 10 = 15$; $15 \times 4¢ = 60¢$; cost $= 60¢ + 60¢ = \$1.20$.

Number of words @ $3¢ = 25 - 10 = 15$; $15 \times 3¢ = 45¢$; cost $= 50¢ + 45¢ = 95¢$.

19. Number of words @ $3¢ = 40 - 10 = 30$; $30 \times 3¢ = 90¢$; cost $= 50¢ + 90¢ = \$1.40$.

Number of words @ $3¢ = 40 - 10 = 30$; $30 \times 3¢ = 90¢$; cost $= 40¢ + 90¢ = \$1.30$.

20. Number of words @ $4¢ = 60 - 10 = 50$; $50 \times 4¢ = \$2$; cost $= 60¢ + \$2 = \$2.60$.

Number of words @ $3¢ = 60 - 10 = 50$; $50 \times 3¢ = \$1.50$; cost $= 50¢ + \$1.50 = \$2$.

21. Number of words @ $4¢ = 19 - 10 = 9$; $9 \times 4¢ = 36¢$; cost $= 60¢ + 36¢ = 96¢$.

Number of words @ $3¢ = 19 - 10 = 9$; $9 \times 3¢ = 27¢$; cost $= 50¢ + 27¢ = 77¢$.

22. Number of words @ $4¢ = 30 - 10 = 20$; $20 \times 4¢ = 80¢$; cost $= 60¢ + 80¢ = \$1.40$.

Number of words @ $3¢ = 30 - 10 = 20$; $20 \times 3¢ = 60¢$; cost $= 50¢ + 60¢ = \$1.10$.

23. Number of words @ $4¢ = 22 - 10 = 12$; $12 \times 4¢ = 48¢$; cost $= 60¢ + 48¢ = \$1.08$.

Number of words @ $3¢ = 22 - 10 = 12$; $12 \times 3¢ = 36¢$; cost $= 50¢ + 36¢ = 86¢$.

24. Number of words @ $5¢ = 17 - 10 = 7$; $7 \times 5¢ = 35¢$; cost $= 75¢ + 35¢ = \$1.10$.

Number of words @ $4¢ = 17 - 10 = 7$; $7 \times 4¢ = 28¢$; cost $= 60¢ + 28¢ = 88¢$.

25. Number of words @ $5¢ = 21 - 10 = 11$; $11 \times 5¢ = 55¢$; cost $= 75¢ + 55¢ = \$1.30$.

Number of words @ $4¢ = 21 - 10 = 11$; $11 \times 4¢ = 44¢$; cost $= 60¢ + 44¢ = \$1.04$.

26. Number of words @ $7¢ = 17 - 10 = 7$; $7 \times 7¢ = 49¢$; cost $= \$1 + 49¢ = \$1.49$.

27. Number of words @ $7¢ = 19 - 10 = 9$; $9 \times 7¢ = 63¢$; cost $= \$1 + 63¢ = \$1.63$.

28. Number of words @ $9¢ = 15 - 10 = 5$; $5 \times 9¢ = 45¢$; cost $= \$1.10 + 45¢ = \$1.55$.

Number of words @ $8¢ = 15 - 10 = 5$; $5 \times 8¢ = 40¢$; cost $= \$1 + 40¢ = \$1.40$.

Page 44

29. 15 words in message; by table, day rate New York to Chicago is 50–3.
Number of words @ $3¢ = 15 - 10 = 5$; $5 \times 3¢ = 15¢$; cost $= 50¢ + 15¢ = 65¢$.

30. By table, night rate New York to Chicago is 40–3.
Number of words @ $3¢ = 15 - 10 = 5$; $5 \times 3¢ = 15¢$; cost $= 40¢ + 15¢ = 55¢$.

31. See Ex. 31, p. 5.

32–39. See Ex. 32–39, p. 6.

Page 58

1. $5 \times 10 - 7 = 50 - 7 = 43$.

2. $5 \times (10 - 7) = 5 \times 3 = 15$.

3. $2 \times 5 + 3 \times 4 = 10 + 3 \times 4 = 10 + 12 = 22$.

4. $16 - 2 \times 2 \times 12 \div 4 = 16 - 4 \times 12 \div 4 = 16 - 48 \div 4 = 16 - 12 = 4$.

5. $(25 - 13) \div 4 \times 2 = 12 \div 4 \times 2 = 3 \times 2 = 6$.

6–12. See Ex. 6–12, p. 90.

Page 93

11–16. See Ex. 11–16, p. 6.

Pages 94–95

1–13. See Ex. 1–13, pp. 6–7.

Page 99

23–24. See Ex. 23–24, p. 7.

Page 104

33–35. See Ex. 33–35, p. 8.

Page 107

38–42. See Ex. 38–42, p. 8.

Page 112

2–9. See Ex. 2–9, p. 8.

Page 116

1. See Ex. 1, p. 8.

2–8. See Ex. 2–8, p. 9.

Page 117

12–16. See Ex. 12–16, p. 10.

Page 128

17–19. See Ex. 17–19, p. 10.

Page 130

8–10. See Ex. 8–10, p. 10.

Page 133

13–19. See Ex. 13–19, p. 11.

Page 145

2–18. See Ex. 2–18, p. 11.

19–21. See Ex. 19–21, p. 12.

2 (§ 253). See Ex. 2, p. 12.

Page 146

8–22. See Ex. 8–22, p. 12.

Page 147

1–14. See Ex. 1–14, p. 13.

Page 148

15–20. See Ex. 15–20, p. 13.

2. See Ex. 2, p. 13.

3–5. See Ex. 3–5, p. 14.

Page 149

6–15 See Ex. 6–15, p. 14.

16. See Ex. 16, p. 15.

Page 155

30. See Ex. 30, p. 15.

Page 164

1–10. See Ex. 1–10, p. 15.

Page 165

1. See Ex. 39, p. 18.
2. See Ex. 40, p. 18.
3. See Ex. 41, p. 18.
4. See Ex. 42, p. 18.
5. See Ex. 43, p. 18.
6. See Ex. 44, p. 18.
7. See Ex. 45, p. 18.
8. See Ex. 46, p. 18.
9. See Ex. 47, p. 18.
10. See Ex. 48, p. 18.
11. See Ex. 49, p. 18.

Page 166

13. See Ex. 8, p. 16.
14. See Ex. 9, p. 16.
15. See Ex. 10, p. 16.
16. See Ex. 11, p. 16.
17. See Ex. 12, p. 16.
18. See Ex. 13, p. 16.
19. See Ex. 14, p. 16.
20. See Ex. 15, p. 16.
21. See Ex. 16, p. 16.

Page 167

22. See Ex. 17, p. 16.
23. See Ex. 18, p. 16.
24. See Ex. 19, p. 17.
25. See Ex. 20, p. 17.
26. See Ex. 21, p. 17.
27. See Ex. 22, p. 17.
28. See Ex. 23, p. 17.
29. See Ex. 24, p. 17.
30. See Ex. 25, p. 17.
31. See Ex. 26, p. 17.

Page 168

32. See Ex. 51, p. 18.
33. See Ex. 52, p. 18.
34. See Ex. 53, p. 18.
35. See Ex. 54, p. 19.
36. See Ex. 55, p. 19.
37. See Ex. 56, p. 19.
38. See Ex. 57, p. 19.
39. See Ex. 58, p. 19.
40. See Ex. 59, p. 19.

Page 172

101–105. See Ex. 101–105, p. 19.

Page 173

1–9. See Ex. 1–9, p. 20.

Page 174

10. See Ex. 11, p. 20.
11. See Ex. 12, p. 20.
12. See Ex. 13, p. 21.
13. See Ex. 14, p. 21.
14. See Ex. 15, p. 21.
15. See Ex. 16, p. 21.
16. See Ex. 17, p. 21.
17. See Ex. 18, p. 21.
18. See Ex. 19, p. 21.
19. See Ex. 20, p. 21.

Page 175

20. See Ex. 21, p. 21.
21. See Ex. 22, p. 21.
22. See Ex. 23, p. 21.
23. See Ex. 24, p. 21.
24. See Ex. 25, p. 21.
25. See Ex. 26, p. 21.
26. See Ex. 27, p. 21.
27. See Ex. 28, p. 21.
28. See Ex. 38, p. 22.

Page 176

29. See Ex. 40, p. 22.
30. See Ex. 41, p. 22.
31. See Ex. 42, p. 22.
32. See Ex. 43, p. 22.
33. See Ex. 44, p. 22.
34. See Ex. 45, p. 22.
35. See Ex. 46–47, p. 23.
36. See Ex. 48, p. 23.
37. See Ex. 49, p. 23.
38. See Ex. 50, p. 23.
39. See Ex. 51, p. 23.
40. See Ex. 52, p. 23.

Pages 179–258

These pages are identical with the corresponding pages in the Second Book. For solutions, see pages 23–74 of the Key.

Page 259

1–2. See Ex. 1–2, p. 90.

3. Since the time of going was 8 hr. 15 min., or $8\frac{1}{4}$ hr., the average speed per hour *going* was 440 mi. ÷ $8\frac{1}{4}$, or $53\frac{1}{3}$ mi.

Since the time of returning was 9 hr., the average speed per hour *returning* was 440 mi. ÷ 9, or $48\frac{8}{9}$ mi.

4–7. See Ex. 4–7, p. 91.

Page 260

8–16. See Ex. 8–16, pp. 91–92.

Page 261

17. See Ex. 107, p. 87.
18. See Ex. 108, p. 87.
19. See Ex. 109, p. 87.
20. See Ex. 106, p. 86.
21. See Ex. 110, p. 87.
22. See Ex. 111, p. 87.
23. See Ex. 104, p. 86.
24. See Ex. 105, p. 86.

Page 262

25. See Ex. 1, p. 101.
26. See Ex. 2, p. 101.
27. See Ex. 3, p. 101.
28. See Ex. 4, p. 101.
29. See Ex. 5, p. 101.
30. See Ex. 6, p. 101.
31. See Ex. 7, p. 101.
32. See Ex. 8, p. 101.
33. See Ex. 9, p. 101.
34. See Ex. 10, p. 101.

Page 263

35. See Ex. 11, p. 101.
36. See Ex. 12, p. 101.
37. See Ex. 13, p. 101.
38. See Ex. 14, p. 102.
39. See Ex. 15, p. 102.
40. See Ex. 16, p. 102.
41. See Ex. 17, p. 102.

Page 264

42. See Ex. 18, p. 102.
43. See Ex. 19, p. 102.
44. See Ex. 20, p. 102.
45. See Ex. 21, p. 102.
46. See Ex. 22, p. 102.
47. See Ex. 23, p. 102.
48. See Ex. 24, p. 102.
49. See Ex. 25, p. 102.

Page 265

50. See Ex. 26, p. 102.
51. See Ex. 27, p. 102.
52. See Ex. 28, p. 102.
53. See Ex. 29, p. 103.
54. See Ex. 30, p. 103.
55. See Ex. 31, p. 103.
56. See Ex. 32, p. 103.
57. See Ex. 33, p. 103.
58. See Ex. 34, p. 103.

Page 266

59. See Ex. 35, p. 103.
60. See Ex. 36, p. 103.
61. See Ex. 37, p. 103.
62. See Ex. 38, p. 103.
63. See Ex. 39, p. 103.
64. See Ex. 40, p. 103.
65. See Ex. 41, p. 103.
66. See Ex. 42, p. 103.

Page 267

67. See Ex. 43, p. 103.
68. See Ex. 44, p. 103.
69. See Ex. 45, p. 103.
70. See Ex. 46, p. 104.
71. See Ex. 47, p. 104.
72. See Ex. 48, p. 104.
73. See Ex. 49, p. 104.
74. See Ex. 50, p. 104.
75. See Ex. 51, p. 104.
76. See Ex. 52, p. 104.
77. See Ex. 53, p. 104.

Page 268

78. See Ex. 12, p. 79.
79. See Ex. 13, p. 79.
80. See Ex. 14, p. 79.
81. See Ex. 15, p. 79.
82. See Ex. 16, p. 79.
83. See Ex. 17, p. 79.
84. See Ex. 18, p. 79.
85. See Ex. 19, p. 79.

Page 269

86. See Ex. 20, p. 80.
87. See Ex. 21, p. 80.
88. See Ex. 22, p. 80.
89. See Ex. 23, p. 80.
90. See Ex. 24, p. 80.
91. See Ex. 25, p. 80.
92. See Ex. 26, p. 80.
93. See Ex. 27, p. 80.
94. See Ex. 28, p. 80.
95. See Ex. 29, p. 80.
96. See Ex. 30, p. 80.

Page 270

97. See Ex. 31, p. 80.
98. See Ex. 32, p. 80.
99. See Ex. 33, p. 80.
100. See Ex. 34, p. 80.
101. See Ex. 35, p. 81.
102. See Ex. 36, p. 81.
103. See Ex. 37, p. 81.
104. See Ex. 38, p. 81.
105. See Ex. 39, p. 81.

Page 271

106. See Ex. 89, p. 85.
107. See Ex. 90, p. 85.
108. See Ex. 91, p. 85.
109. See Ex. 92, p. 85.
110. See Ex. 93, p. 86.
111. See Ex. 94, p. 86.
112. See Ex. 95, p. 86.
113. See Ex. 96, p. 86.

Page 272

114. See Ex. 40, p. 81.
115. See Ex. 41, p. 81.
116. See Ex. 42, p. 81.
117. See Ex. 43, p. 81.
118 See Ex. 44, p. 81.
119. See Ex. 45, p. 81.
120. See Ex. 46, p. 82.
121 See Ex. 47, p. 82.

Page 273

122. See Ex. 48, p. 82.
123. See Ex. 49, p. 82.
124. See Ex. 50, p. 82.
125. See Ex. 51, p. 82.
126. See Ex. 52, p. 82.
127. See Ex. 53, p. 82.
128. See Ex. 54, p. 82.
129. See Ex. 55, p. 82.
130. See Ex. 56, p. 82.
131. See Ex. 57, p. 82.
132. See Ex. 58, p. 83.
133. See Ex. 59, p. 83.

Page 274

134. See Ex. 60, p. 83.
135. See Ex. 61, p. 83.
136. See Ex. 62, p. 83.
137. See Ex. 63, p. 83.
138. See Ex. 64, p. 83.
139. See Ex. 65, p. 83.

Page 278

160. See Ex. 31, p. 95.
161. See Ex. 32, p. 95.
162. See Ex. 33, p. 95.
163. See Ex. 34, p. 95.
164. See Ex. 22, p. 95.
165. See Ex. 23, p. 95.
166. See Ex. 24, p. 95.
167. See Ex. 2, p. 96.
168. See Ex. 3, p. 96.
169. See Ex. 4, p. 96.
170. See Ex. 5, p. 96.
171. See Ex. 11, p. 96.
172. See Ex. 12, p. 96.
173. See Ex. 14, p. 96.
174 See Ex. 15, p. 96.

Page 279

175. See Ex. 1, p. 97.
176. See Ex. 2, p. 97.
177. See Ex. 3, p. 97.
178. See Ex. 4, p. 97.
179. See Ex. 14, p. 98.
180. See Ex. 15, p. 98.
181. See Ex. 16, p. 98.
182. See Ex. 17, p. 98.

Page 280

9. See Ex. 18, p. 98.
10. See Ex. 32, p. 93.
11. See Ex. 33, p. 93.
12. See Ex. 34, p. 93.
13. See Ex. 37, p. 94.
14. See Ex. 38, p. 94.
15. See Ex. 43, p. 94.
16. See Ex. 44, p. 94.
17. See Ex. 40, p. 94.
18. See Ex. 41, p. 94.

Page 282

35. See Ex. 21, p. 98.
37. See Ex. 28, p. 97.
38. See Ex. 24, p. 99.

Page 284

14. See Ex. 26, p. 99.
15. See Ex. 27, p. 99.
16. See Ex. 28, p. 99.
17. See Ex. 29, p. 99.
18. See Ex. 30, p. 99.
19. See Ex. 31, p. 99.
20. See Ex. 32, p. 99.
21. See Ex. 33, p. 99.
22. Since 625 = $\frac{5}{8}$ of 1000, 625 × .81 = $\frac{5}{8}$ of 810 = 506.25.
23. See Ex. 35, p. 99.
24. See Ex. 36, p. 99.
25. See Ex. 37, p. 99.
26. See Ex. 38. p. 99.
27. See Ex. 39, p. 99.
28. See Ex. 40, p. 99.

30. See Ex. 44, p. 100.
31. See Ex. 45, p. 100.
32. See Ex. 46, p. 100.
33. See Ex. 47, p. 100.
34. See Ex. 48, p. 100.
35. See Ex. 49, p. 100.
36. See Ex. 50, p. 100.
37. See Ex. 51, p. 100.
38. See Ex. 52, p. 100.
39. See Ex. 53, p. 100.
40. See Ex. 54, p. 100.
41. See Ex. 55, p. 100.
42. See Ex. 56, p. 100.
43. See Ex. 57, p. 100.
44. See Ex. 58, p. 101.
45. See Ex. 59, p. 101.
46. See Ex. 60, p. 101.
47. See Ex. 61, p. 101.
48. See Ex. 62, p. 101.

Pages 294–295

2–24. See Ex. 2–24, pp. 104–106.

Page 298

2–10. See Ex. 2–10, pp. 106–107.

Page 299

2–19. See Ex. 2–19, pp. 107–108.

Page 302

3–27. See Ex. 3–27, pp. 109–111.

Page 303

29–36. See Ex. 29–36, pp. 111–112.
2. See Ex. 2, p. 112.

Pages 304–308

3–57. See Ex. 3–57, pp. 113–121.

Pages 310–314

2–47. See Ex. 2–47, pp. 121–129.

Page 316

32. See Ex. 26, p. 134.
33. See Ex. 29, p. 134.
34. See Ex. 28, p. 134.
35. See Ex. 24, p. 129.
36. See Ex. 25, p. 129.
37. See Ex. 26, p. 129.

Page 317

38. See Ex. 35, p. 135.
39. See Ex. 27, p. 134.
40. See Ex. 28, p. 129.
41. See Ex. 29, p. 129.
42. See Ex. 30, p. 129.
43. See Ex. 31, p. 129.
44. See Ex. 32, p. 129.
45. See Ex. 33, p. 135.
46. See Ex. 34, p. 135.
47. See Ex. 34, p. 130.
48. See Ex. 35, p. 130.
49. See Ex. 36, p. 130.

Page 318

50. See Ex. 37, p. 130.

Pages 319–320

1–33. See Ex. 1–33, pp. 130–132.

Page 321

37. See Ex. 36, p. 132.
38. See Ex. 37, p. 132.
39. See Ex. 38, p. 132.
40. See Ex. 39, p. 132.
41. See Ex. 40, p. 132.
42. See Ex. 41, p. 132.
43. See Ex. 42, p. 132.
44. See Ex. 43, p. 133.
45. See Ex. 44, p. 133.
46. See Ex. 45, p. 133.
47. See Ex. 46, p. 133.

Pages 324–326

2–33. See Ex. 2–33, pp. 135–141.

Pages 328–329

1–14. See Ex. 1–14, pp. 141–143.

Page 335

1–8. See Ex. 1–8, pp. 143–144.

Pages 336–337

1–6. See Ex. 1–6, p. 144.

Pages 339–341

1–36. See Ex. 1–36, pp. 144–147.

Page 342

1. See Ex. 6, p. 147.
2. See Ex. 8, p. 147.
3. See Ex. 12, p. 148.
6. See Ex. 7, p. 149.

Page 343

7. See Ex. 3, p. 149.
8. See Ex. 6, p. 149.
9. See Ex. 4, p. 149.
10. See Ex. 1, p. 151.
11. See Ex. 2, p. 151.
12. See Ex. 3, p. 151.
13. See Ex. 4, p. 151.
14. See Ex. 5, p. 151.
15. See Ex. 6, p. 151.
16. See Ex. 15, p. 150.
17. See Ex. 16, p. 150.
18. See Ex. 17, p. 150.

Page 344

19. See Ex. 1, p. 152.

20. See Ex. 2, p. 152.

21. See Ex. 3, p. 152.

22. See Ex. 4, p. 152.

23. See Ex. 11, p. 152.

24. See Ex. 12, p. 152.

25. See Ex. 7, p. 153.

26. See Ex. 1, p. 153.

27. See Ex. 2, p. 153.

28. See Ex. 3, p. 153.

29. See Ex. 4, p. 153.

30. See Ex. 9, p. 154.

Page 345

31. See Ex. 10, p. 154.

32. See Ex. 1, p. 154.

33. See Ex. 2, p. 154.

34. See Ex. 3, p. 154.

35. See Ex. 4, p. 154.

36. See Ex. 5, p. 154.

37. See Ex. 6, p. 155.

38. See Ex. 7, p. 155.

39. See Ex. 8, p. 155.

40. See Ex. 9, p. 155.

Page 346

41. See Ex. 10, p. 155.

42. See Ex. 11, p. 155.

43. See Ex. 12, p. 155.

44. See Ex. 13, p. 155.

45. See Ex. 14, p. 155.

46. See Ex. 15, p. 155.

47. See Ex. 16, p. 155.

48. See Ex. 17, p. 155.

49. See Ex. 18, p. 155.

50. See Ex. 19, p. 156.

51. See Ex. 20, p. 156.

52. See Ex. 21, p. 156.

53. See Ex. 22, p. 156.

Page 347

54. See Ex. 23, p. 156.

55. See Ex. 24, p. 156.

56. See Ex. 25, p. 156.

57. See Ex. 26, p. 156.

58. See Ex. 27, p. 156.

59. See Ex. 28, p. 157.

60. See Ex. 29, p. 157.

Pages 348–353

1–56. See Ex. 1–56, pp. 157–160.

Page 354

5. See Ex. 4, p. 163.

6. See Ex. 5, p. 163.

7. See Ex. 8, p. 163.

8. See Ex. 9, p. 163.

9. See Ex. 12, p. 163.

10. See Ex. 13, p. 163.

11. Since .0225 of the number is \$864, the number = \$864 ÷ .0225, or \$38,400.

12. Since $\frac{5}{8}$ of the number is 5500, the number = 5500 ÷ $\frac{5}{8}$, or 8800.

13. Since .05 of the number is \$2.25, the number = \$2.25 ÷ .05, or \$45.

14. Since $\frac{1}{3}$ of the number is \$5.73, the number = \$5.73 ÷ $\frac{1}{3}$, or \$17.19.

15. Since .0625 of the number is 5200, the number = 5200 ÷ .0625, or 83,200.

16. Since $\frac{5}{8}$ of the number is 4525, the number = 4525 ÷ $\frac{5}{8}$, or 7240.

17. The number plus 15 % of it = 115 % of it = 138;
Then the number = 138 ÷ 1.15, or 120.

18. The number plus 25 %, or $\frac{1}{4}$, of it = $\frac{5}{4}$ of it = 365;
Then the number = 365 ÷ $\frac{5}{4}$, or 292.

19. The number less $12\frac{1}{2}$ %, or $\frac{1}{8}$, of it = $\frac{7}{8}$ of it = 2345;
Then the number = 2345 ÷ $\frac{7}{8}$, or 2680.

20. The number less 35 % of it = 65 % of it = 1612;
Then the number = 1612 ÷ .65, or 2480.

21. See Ex. 1, p. 168.
22. See Ex. 2, p. 168.
23. See Ex. 3, p. 168.
24. See Ex. 4, p. 168.
25. See Ex. 5, p. 168.
26. See Ex. 6, p. 168.
27. See Ex. 7, p. 168.
28. See Ex. 8, p. 168.
29. See Ex. 9, p. 168.
30. See Ex. 10, p. 168.
31. See Ex. 11, p. 168.
32. See Ex. 12, p. 168.
33. See Ex. 13, p. 169.
34. See Ex. 14, p. 169.
35. See Ex. 15, p. 169.

Page 355

36. See Ex. 19, p. 174.
37. See Ex. 8, p. 175.
38. See Ex. 17, p. 163.
39. See Ex. 15, p. 162.
40. See Ex. 17, p. 174.
41. See Ex. 7, p. 168.
42. See Ex. 15, p. 163.
43. See Ex. 16, p. 166.
44. See Ex. 9, p. 168.
45. See Ex. 19, pp. 166, 167.

Page 356

46. See Ex. 12, p. 175.
47. See Ex. 5, p. 167.
48. See Ex. 6, p. 167.
49. See Ex. 15, p. 176.
50. See Ex. 17, p. 166.
51. See Ex. 18, p. 169.
52. See Ex. 19, p. 169.
53. See Ex. 20, p. 169.
54. See Ex. 22, p. 174.

Page 357

55. See Ex. 33, p. 172.
56. See Ex. 34, p. 172.
57. See Ex. 35, p. 172.
58. See Ex. 36, p. 172.
59. See Ex. 37, p. 172.
60. See Ex. 16, p. 162.
61. See Ex. 21, pp. 164, 165.

Pages 360–361

2–21. See Ex. 2–21, pp. 176–177.

Pages 362–364

1–21. See Ex. 1–21, pp. 177–179.

Pages 365–366

1–12. See Ex. 1–12, pp. 179–180.

Pages 367–368

1–13. See Ex. 1–13, pp. 180–181.

Pages 369–375

1–68. See Ex. 1–68, pp. 181–185.

Pages 377–378

9–31. See Ex. 9–31, pp. 186–189.

Page 379

1–8. See Ex. 1–8, p. 190.

Page 380

1–14. See Ex. 1–14, pp. 190–191.

Page 381

2–17. See Ex. 2–17, pp. 191–193.

Page 382

1–23. See Ex. 1–23, pp. 193–196.

Page 383

2–19. See Ex. 2–19, pp. 196–197.

Page 385

2–18. See Ex. 2–18, pp. 197–199.

Page 386

1–28. See Ex. 1–28, pp. 200–204.

Page 387

1–18. See Ex. 1–18, pp. 204–205.

Pages 388–389

2–15. See Ex. 2–15, pp. 205–206.

Pages 390–391

2–9. See Ex. 2–9, pp. 206–207.

2–15. See Ex. 2–15, pp. 207–208.

Page 392

2–7. See Ex. 2–7, p. 208.

Page 393

2. Principal	$6200	
Simple interest on $6200 at 6% for 2 yr. 6 mo. . . .	930	
The 1st annual int., $372, is unpaid for 1 yr. 6 mo.		
The 2d annual int., $372, is unpaid for 6 mo.		
Interest on $372 at 6% for . . 2 yr. =	44	64
Amount of $6200	$7174	64

3. See Ex. 2, p. 209.

4. Principal	$8760	
Simple interest on $8760 at 5% for 3 yr. 8 mo. . . .	1606	
The 1st annual int., $438, is unpaid for 2 yr. 8 mo.		
The 2d annual int., $438, is unpaid for 1 yr. 8 mo.		
The 3d annual int., $438, is unpaid for 8 mo.		
Interest on $438 at 5% for . . 5 yr. =	109	50
Amount of $8760	$10,475	50

5. Principal	$10,000	
Simple interest on $10,000 at 3% for 2 yr. 4 mo. 24 da.	720	
The 1st annual int., $300, is unpaid for 1 yr. 4 mo. 24 da.		
The 2d annual int., $300, is unpaid for 4 mo. 24 da.		
Interest on $300 at 3% for . . 1 yr. 9 mo. 18 da. =	16	20
Amount of $10,000	$10,736	20

6. See Ex. 3, p. 209.

7. Principal	$36,500	
Simple interest on $36,500 at 6% for 1 yr. 7 mo. 18 da. .	3,577	
Int. on 1st annual int., $2190, at 6% for 7 mo. 18 da. =	83	22
Amount of $36,500	$40,160	22

Page 395

2–19. See Ex. 2–19, pp. 209–212.

Page 397

1. 3 bu. 2 pk. 6 qt. = 14 pk. 6 qt. = 118 qt. = 236 pt.

2. 4 T. 8 cwt. 9 oz. = 88 cwt. 9 oz. = 8800 lb. 9 oz. = 140,809 oz.

3. 1 mi. 27 rd. 4 yd. 2 ft. 6 in. = 347 rd. 4 yd. 2 ft. 6 in. = 1912½ yd. 2 ft. 6 in. = 5739½ ft. 6 in. = 68,880 in.

4. 5 A. 100 sq. rd. 18 sq. yd. 3 sq. ft. 36 sq. in. = 900 sq. rd. 18 sq. yd. 3 sq. ft. 36 sq. in. = 27,243 sq. yd. 3 sq. ft. 36 sq. in. = 245,190 sq. ft. 36 sq. in. = 35,307,396 sq. in.

5. 73,286″ = 1221′ 26″ = 20° 21′ 26″.

6. 208,738 sec. = 3478 min. 58 sec. = 57 hr. 58 min. 58 sec. = 2 da. 9 hr. 58 min. 58 sec.

7. 36,894 cu. in. = 21 cu. ft. 606 cu. in.

8. 48,682 gr. = 2028 pwt. 10 gr. = 101 oz. 8 pwt. 10 gr. = 8 lb. 5 oz. 8 pwt. 10 gr.

9. See Ex. 22, p. 134.
10. See Ex. 17, p. 133.
11. See Ex. 5, p. 147.
12. See Ex. 9, p. 147.
13. See Ex. 14, p. 148.
14. See Ex. 3, p. 147.
15. See Ex. 18, p. 148.

Page 398

16. See Ex. 5, p. 149.
17. See Ex. 6, p. 153.
18. See Ex. 6, p. 153.
19. See Ex. 8, p. 151.
20. See Ex. 5, pp. 152, 153.
21. See Ex. 16, p. 163.
22. See Ex. 10, p. 168.
23. See Ex. 20, p. 174.

Page 399

24. See Ex. 13, p. 176.
25. See Ex. 14, p. 176.

26. The cost of the 1st policy for 1 yr. = 2 × \$29.40, or \$58.80;
The cost of the 1st policy for 20 yr. = 20 × \$58.80, or \$1176;
The cost of the 2d policy for 1 yr. = 2 × \$46.40, or \$92.80;
The cost of the 2d policy for 10 yr. = 10 × \$92.80, or \$928;
Hence, the 20-payment life policy costs \$1176 – \$928, or \$248, more.

27. The difference in the annual premiums per \$1000 = \$50.80 – \$48.10, or \$2.70;
The difference in the annual premiums for \$4000 = 4 × \$2.70, or \$10.80;
In 20 yr. the policy for age 20 would therefore have cost him 20 × \$10.80, or \$216, less.

28. His expectation of life is 28.48 yr.; since he lives 2 yr. beyond this he will have paid 31 premiums. The premium for \$1000 being \$32.20, the total premium on \$2000 for 31 yr. = 2 × 31 × \$32.20 = \$1996.40. Hence, he will have paid \$2000 – \$1996.40, or \$3.60, less than the face of the policy.

29. Since 1⅖%, or .014, of the insured value is \$210, the insured value = \$210 ÷ .014, or \$15,000. Since \$15,000 is ⅚ of the actual value, the value of the merchant's stock = \$15,000 ÷ ⅚, or \$18,000.

30. The building is insured for as many times \$1000 as \$8.75 is contained times in \$66.50; that is, 7.6 × \$1000, or \$7600.

\$8.75 ÷ \$1000 = .00875, or .00⅞; that is, the premium is ⅞% of the value insured.

31. The total amount insured = $13,200 + $22,000, or $35,200;
The total annual premium = .01$\frac{1}{4}$ of $35,200, or $440.
The 1st company had to pay $\frac{13200}{35200}$, or $\frac{3}{8}$, of $8400 = $3150.
The 2d company had to pay $\frac{8}{8} - \frac{3}{8}$, or $\frac{5}{8}$, of $8400 = $5250.

32. $\frac{2}{3}$ of $64,800 = $43,200, the insured value;
43.200 × $7.50 = $324, one premium;
8 × $324 = $2592, eight premiums;
Since the owners received in insurance $50,000 − $43,200, or $6800, less than the loss by fire, their total loss, including the premiums paid, = $6800 + $2592, or $9392.

Page 400

33. Since 5.25 mills, or $.00525, is the tax per dollar, $68,502 is the tax on as many dollars as $.00525 is contained times in $68,502, or $13,048,000, the total assessed valuation.

34. At $.0116 per dollar, the tax on $19,800 = 19,800 × $.0116, or $229.68;
Since 90% of the true value was $19,800, the true value = $19,800 ÷ .90, or $22,000; $\frac{3}{4}$ of $22,000 = $16,500, the insured value;
At $1.35 per $100, the insurance on $16,500 = 165.00 × $1.35, or $222.75;
Then the cost of taxes and insurance = $229.68 + $222.75, or $452.43.

35. The total tax = $11,064.91 + $3070.29 + $228.99 + $97.10 = $14,461.29; since the assessed valuation was 1918.466 thousand dollars, the rate of tax per $1000 = $14,461.29 ÷ 1918.466 = $7.537⁺, or $7.54.

36. The number of gallons = 6255 lb. ÷ 7$\frac{1}{2}$ lb., or 834 gal.;
The rate per gallon = $166.80 ÷ 834 = $.20, or 20¢.

37. 25,200 bu. = 25,200 × 80 lb., or 2,016,000 lb. = (2,016,000 ÷ 2240) L.T., or 900 L.T.; hence, the specific duty = 900 × $.67, or $603.

38. 36 T. = 72,000 lb.; hence, the number of bushels = 72,000 lb. ÷ 48 lb., or 1500 bu.;
The amount of the duty = 1500 × $.30, or $450.

39. The cost of 15 gross, or 180 doz., doll heads = 180 × $1.60, or $288;
The cost of 750,000 marbles = 750.000 × $.12, or $90;
The total cost at time of purchase = $288 + $90, or $378;
The duty on both = 35% of $378, or $132.30;
The total cost, including duty = $378 + $132.30, or $510.30.

40. The volume of 450 timbers = 450 × ($\frac{2}{3}$ × 1 × 20) cu. ft. = 6000 cu. ft.;
The volume of 360 timbers = 360 × ($\frac{3}{4}$ × $\frac{4}{3}$ × 24) cu. ft. = 8640 cu. ft.;
Total volume of the timbers = 6000 cu. ft. + 8640 cu. ft. = 14,640 cu. ft.;

(*Continued on next page.*)

At 1¢ per cubic foot the duty on the timbers = 14,640 × \$.01, or \$146.40;
1100 boards contained 1100 × (2 × ¾ × 12) board feet, or 19,800 ft.;
At \$2 per M the duty on the boards = 19.800 × \$2, or \$39.60;
The total duty = \$146.40 + \$39.60 = \$186.

41. 60,000 sheets contained 60,000 × (24 × 20) sq. in., or 28,800,000 sq. in.;
The number of reams = 28,800,000 sq. in. ÷ 180,000 sq. in., or 160 reams;
160 × 15¾ lb. = 2520 lb., the total weight;
2520 × \$.24 = \$604.80, the total value;
2520 × \$.03½ = \$88.20, the specific duty;
15% of \$604.80 = \$90.72, the ad valorem duty;
\$88.20 + \$90.72 = \$178.92, the whole duty.

Page 401

42. 5 Kg. butter costs 5 × 1½ crowns, or 7½ crowns = 7½ × \$.268, or \$2.01.

43. 14 M.T. hay costs 14 × 65 crowns, or 910 crowns = 910 × \$.268, or \$243.88.

44. 4 M.T., or 40 Q., potatoes costs 40 × 4½ crowns, or 180 crowns = 180 × \$.268, or \$48.24.

45. 20 Q. flour costs 20 × 19 crowns, or 380 crowns = 380 × \$.268, or \$101.84.

46. At the rate of 1 mm. per second, in 1 hr., or 3600 sec., a snail will pass over 3600 mm., or 3.6 m. = 3.6 × 39.37 in., or 141.732 in. = 11.811 ft.

47. If the earth goes 30 Km. per second, in 1 min., or 60 sec., it goes 60 × 30 Km., or 1800 Km. = 1800 × .62137 mi., or 1118.466 mi.

48. 9 l. = 9 × 1.0567 qt., or 9.5103 qt. = 2.377575 gal.;
100 Km. = 100 × .62137 mi., or 62.137 mi.;

Since the car used 2.377575 gal. of gasoline in going 62.137 mi., it could go as many miles on 1 gal. of gasoline as 2.377575 is contained times in 62.137 mi., or 26.13+ mi.

49. 157° 51′ 34″ W., the longitude of Honolulu
71° 3′ 50″ W., the longitude of Boston
15) 86° 47′ 44″, the difference in longitude
5° 47′ 11⁻″; ∴ 5 hr. 47 min. 11 sec. is the difference in time.

Since Honolulu is *west* of Boston, the time is *earlier* in Honolulu; that is, when it is noon at Boston, it is 5 hr. 47 min. 11 sec. before noon at Honolulu, or 12 min. 49 sec. after 6 A.M.

50.

hr.	min.	sec.
5	59	25, diff. in time
		15
89	51	15

89° 51′ 15″, diff. in longitude.

89° 51′ 15″
9° 58′ 25″ E. (Hamburg)
79° 52′ 50″ W. (Charleston)

Since the time of Charleston is *earlier* than that of Hamburg, Charleston is *west* of Hamburg; hence, Charleston is in longitude 79° 52′ 50″ W.

51. 2)\$20, int. for 60 da. at 6%
\$10, int. for 30 da. at 6%

The interest at 7 % = \$10 + $\frac{1}{6}$ of \$10 = \$10 + \$1.67^{-}, or \$11.67.
The interest at $3\frac{1}{2}$% = $\frac{7}{12}$ of \$10 = \$5.83$\frac{1}{3}$, or \$5.83.
The interest at 5 % = \$10 − $\frac{1}{6}$ of \$10 = \$10 − \$1.67^{-}, or \$8.33.

52. 20)\$50.00, int. for 60 da. at 6%
+ 2.50, int. for 3 da. at 6%
\$52.50, int. for 63 da. at 6%

The interest at 7 % = \$52.50 + $\frac{1}{6}$ of \$52.50 = \$52.50 + \$8.75, or \$61.25.
The interest at $3\frac{1}{2}$% = $\frac{7}{12}$ of \$52.50 = \$30.62$\frac{1}{2}$.
The interest at 5 % = \$52.50 − $\frac{1}{6}$ of \$52.50 = \$52.50 − \$8.75, or \$43.75.

53. 4)\$45.00, int. for 60 da. at 6%
\$11.25, int. for 15 da. at 6%

The interest at 7 % = \$11.25 + $\frac{1}{6}$ of \$11.25 = \$11.25 + \$1.87$\frac{1}{2}$, or \$13.12$\frac{1}{2}$.
The interest at $3\frac{1}{2}$% = $\frac{7}{12}$ of \$11.25 = \$6.56$\frac{1}{4}$, or \$6.56.
The interest at 5 % = \$11.25 − $\frac{1}{6}$ of \$11.25 = \$11.25 − \$1.87$\frac{1}{2}$, or \$9.37$\frac{1}{2}$.

54. 2)\$80, int. for 60 da. at 6%
+ 40, int. for 30 da. at 6%
\$120, int. for 90 da. at 6%

The interest at 7 % = \$120 + $\frac{1}{6}$ of \$120 = \$120 + \$20, or \$140.
The interest at $3\frac{1}{2}$% = $\frac{7}{12}$ of \$120 = \$70.
The interest at 5 % = \$120 − $\frac{1}{6}$ of \$120 = \$120 − \$20, or \$100.

55.

Int. on \$1 for 2 mo. at 6%	= \$.01
Int. on \$1 for 5 da. at 6%	= .000$\frac{5}{6}$
Int. on \$1 for 2 mo. 5 da. at 6%	= \$.010$\frac{5}{6}$

The interest on \$547.20 at 6% = 547.20 × \$.010$\frac{5}{6}$ = \$5.928, or \$5.93.

The interest at 7 % = \$5.928 + $\frac{1}{6}$ of \$5.928 = \$5.928 + \$.988, or \$6.92.
The interest at $3\frac{1}{2}$% = $\frac{7}{12}$ of \$5.928 = \$3.458, or \$3.46.
The interest at 5 % = \$5.928 − $\frac{1}{6}$ of \$5.928 = \$5.928 − \$.988 = \$4.94.

56.

Int. on \$1 for 1 yr. at 6%	= \$.06
Int. on \$1 for 7 mo. at 6%	= .035
Int. on \$1 for 12 da. at 6%	= .002
Int. on \$1 for 1 yr. 7 mo. 12 da. at 6%	= \$.097

The interest on \$4680 at 6% = 4680 × \$.097 = \$453.96.

The interest at 7% = \$453.96 + $\frac{1}{6}$ of \$453.96 = \$453.96 + \$75.66 = \$529.62.

The interest at $3\frac{1}{2}$% = $\frac{7}{12}$ of \$453.96 = \$264.81.

The interest at 5% = \$453.96 − $\frac{1}{6}$ of \$453.96 = \$453.96 − \$75.66 = \$378.30.

57. Int. on \$1 for 2 yr. at 6% = \$.12
Int. on \$1 for 1 mo. at 6% = .005
Int. on \$1 for 21 da. at 6% = $.003\frac{1}{2}$
Int. on \$1 for 2 yr. 1 mo. 21 da. at 6% = $\$1.28\frac{1}{2}$

The interest on \$5860 at 6% = $5860 \times \$.128\frac{1}{2}$ = \$753.01.

The interest at 7% $= \$753.01 + \frac{1}{6}$ of $\$753.01 = \$753.01 + \$125.50^{+}$, or \$878.51.

The interest at $3\frac{1}{2}\% = \frac{7}{12}$ of $\$753.01 = \$439.256^{-}$, or \$439.26.

The interest at 5% $= \$753.01 - \frac{1}{6}$ of $\$753.01 = \$753.01 - \$125.50^{+}$, or \$627.51.

58. The time from May 19 to June 8 is 20 da.;
The interest on \$1 for 20 da. at 6% $= \$.003\frac{1}{3}$;
The interest on \$30,000 for 20 da. at 6% $= 30{,}000 \times \$.003\frac{1}{3} = \$100$.
The interest at 7% $= \$100 + \frac{1}{6}$ of $\$100 = \$100 + \$16.67^{-}$, or \$116.67.
The interest at $3\frac{1}{2}\% = \frac{7}{12}$ of $\$100 = \$58.33\frac{1}{3}$, or \$58.33.
The interest at 5% $= \$100 - \frac{1}{6}$ of $\$100 = \$100 - \$16.67^{-}$, or \$83.33.

59. The exact interest of \$21,900 for 45 da. $= \frac{45}{365}$ of $.05 \times \$21{,}900 = \$135$.

60. Simple int. on \$1 for 3 yr. at 6% = \$.18
Simple int. on \$1 for 5 mo. at 6% = .025
Simple int. on \$1 for 24 da. at 6% = .004
Simple int. on \$1 for 3 yr. 5 mo. 24 da. at 6% = \$.209
The simple interest on \$10,000 = 10,000 × \$.209 = \$2090;
The amount at simple interest = \$12,090.

Principal	\$10000	
Simple interest on \$10,000 at 6% for 3 yr. 5 mo. 24 da.	2090	
The 1st annual int., \$600, is unpaid for 2 yr. 5 mo. 24 da.		
The 2d annual int., \$600, is unpaid for 1 yr. 5 mo. 24 da.		
The 3d annual int., \$600, is unpaid for 5 mo. 24 da.		
Interest on \$600 at 6% for . . . 4 yr. 5 mo. 12 da. =	160	20
Amount of \$10,000 at annual interest	\$12250	20

The amount of \$1 for 3 yr. at 6% (table, p. 396) = \$1.191016
The interest on \$1.191016 for 5 mo. 24 da. at 6% = $.034539^{+}$
The amount of \$1 for 3 yr. 5 mo. 24 da. at 6% = \$1.225555
The amount of \$10,000 at compound interest = 10,000 × \$1.225555, or \$12,255.55.

61. Since the interest he receives annually, 2 × \$28.25, or \$56.50, is $2\frac{1}{2}\%$ of the principal, the amount of his deposit = \$56.50 ÷ .025, or \$2260.

The interest in 1 yr. is $2\frac{1}{2}\%$ of the principal; hence it will amount to 100% of the principal in as many years as $2\frac{1}{2}\%$ is contained times in 100%, or 40 yr.

Page 402

62. $\frac{1}{3}$ of \$600 = \$200; since $\frac{1}{3}$ of the principal plus the interest for a quarter = \$205.25, the interest alone = \$205.25 − \$200, or \$5.25; then the yearly interest on \$600 = 4 × \$5.25, or \$21; \$21 ÷ \$600 = .03½; that is, the interest per year was 3½% of the principal.

63. See Ex. 9, p. 209.

---

1. $2x - 36 = 60 - 6x$

Transposing, $2x + 6x = 60 + 36$

Uniting terms, $8x = 96$

Dividing by 8, $x = 12.$

2. $x + \frac{1}{7}x - \frac{1}{5}x = 33$

Multiplying by 35, $35x + 5x - 7x = 33 \times 35$

Uniting terms, $33x = 33 \times 35$

Dividing by 33, $x = 35.$

3. $7x - 30 = 10 + 16 - 7x$

Transposing, $7x + 7x = 10 + 16 + 30$

Uniting terms, $14x = 56$

Dividing by 14, $x = 4.$

4. $\frac{2}{3}x - \frac{1}{5}x + \frac{1}{4}x + \frac{1}{12}x = 8$

Multiplying by 60, $40x - 12x + 15x + 5x = 480$

Uniting terms, $48x = 480$

Dividing by 48, $x = 10.$

5. $9x + 13 - 6x - x = 6x + 12 - 4x + 13 - 3x$

Transposing, $9x - 6x - x - 6x + 4x + 3x = 12 + 13 - 13$

Uniting terms, $3x = 12$

Dividing by 3, $x = 4.$

6. $\frac{1}{2}x - 4 + \frac{3}{4}x + 3 - 14x = 19 + \frac{1}{4}x - 6x - 10 - 8x$

Transposing, $\frac{1}{2}x + \frac{3}{4}x - 14x - \frac{1}{4}x + 6x + 8x = 19 - 10 + 4 - 3$

Uniting terms, $x = 10.$

7. $x + 2y = 7$ (1)

$2x - y = 4$ (2)

Multiplying (2) by 2, $4x - 2y = 8$ (3)

Adding (1) and (3), $5x = 15; \therefore x = 3$

Substituting 3 for x in (1), $3 + 2y = 7; \therefore y = 2.$

8. $7x - 2y = 3$ (1)

$5x + 3y = 11$ (2)

Multiplying (1) by 3, $21x - 6y = 9$ (3)

Multiplying (2) by 2, $10x + 6y = 22$ (4)

Adding (3) and (4), $31x = 31; \therefore x = 1$

Substituting 1 for x in (2), $5 + 3y = 11; \therefore y = 2.$

9. $x + \frac{1}{2}y = 16$ (1)
$\frac{1}{4}x + y = 20$ (2)
Multiplying (1) by 2, $2x + y = 32$ (3)
Multiplying (2) by 4, $2x + 4y = 80$ (4)
Subtracting (3) from (4), $3y = 48$; $\therefore y = 16$
Substituting 16 for y in (3), $2x + 16 = 32$; $\therefore x = 8$.

10. $\frac{1}{3}x - \frac{1}{5}y = 3$ (1)
$\frac{1}{5}x + \frac{1}{2}y = 8$ (2)
Multiplying (1) by 15, $5x - 3y = 45$ (3)
Multiplying (2) by 10, $2x + 5y = 80$ (4)
Multiplying (3) by 5, $25x - 15y = 225$ (5)
Multiplying (4) by 3, $6x + 15y = 240$ (6)
Adding (5) and (6), $31x = 465$; $\therefore x = 15$
Substituting 15 for x in (4), $30 + 5y = 80$; $\therefore y = 10$.

11. Let $x =$ the number of successful shots
Then, $x - 12 =$ the number of unsuccessful ones
$x + x - 12 = 32$
$2x = 32 + 12 = 44$
$x = 22$, the number of shots that hit the target.

12. Let $x =$ the weight of the shell in pounds
Then, $\frac{1}{4}x + 15 =$ the weight of the powder in pounds
$x + \frac{1}{4}x + 15 = 1265$
$\frac{5}{4}x = 1265 - 15$, or 1250
Multiplying by 4, $5x = 5000$
$x = 1000$, the weight of the shell in pounds
$\frac{1}{4}x + 15 = 265$, the weight of the powder in pounds.

13. Let $x =$ the number of minutes the trip took
Then, $\frac{3}{5}x = 233 - 2$, or 231
Multiplying by 5, $3x = 1155$
$x = 385$, the number of minutes, or 6 hr. 25 min.

14. Let $x =$ the number of dollars the reporter earned
Then, $x + 5 =$ the number of dollars the artist earned
$\frac{1}{5}x - 1 = \frac{1}{7}$ of $(x + 5)$
$\frac{1}{5}x - 1 = \frac{1}{7}x + \frac{5}{7}$
Multiplying by 35, $7x - 35 = 5x + 25$
$7x - 5x = 25 + 35$
$2x = 60$
$x = 30$, the reporter's salary in dollars.

Page 403

15. Let $x =$ the length of each lower mast in feet

Then, $\frac{2}{5}x + 4 = 58$

$\frac{2}{5}x = 54$

Multiplying by 5, $2x = 270$

$x = 135$, the length in feet.

16. Let $x =$ the number of pounds of zinc

Then, $2x =$ the number of pounds of tin

and $8\frac{1}{2} \times 2x$, or $17x =$ the number of pounds of copper

$x + 2x + 17x = 5000$

$20x = 5000$

$x = 250$, the number of pounds of zinc

$2x = 500$, the number of pounds of tin

$17x = 4250$, the number of pounds of copper.

17. Let $x =$ the number of dollars, National City Bank

Then, $x - 2{,}778{,}500 =$ the number of dollars, all others

$x + x - 2{,}778{,}500 = 15{,}278{,}500$

$2x = 15{,}278{,}500 + 2{,}778{,}500$, or $18{,}057{,}000$

$x = 9{,}028{,}500$, number of dollars, National City Bank.

18. Let $x =$ the number of cents duty per M on shingles

and $y =$ the number of cents duty per M on laths

Then, $40x + 160y = 5200$ (1)

and $80x + 70y = 4150$ (2)

Multiplying (1) by 2, $80x + 320y = 10{,}400$ (3)

Subtracting (2) from (3), $250y = 6250$; $\therefore y = 25$

Substituting 25 for y in (1), $40x + 4000 = 5200$; $\therefore x = 30$

Therefore the rate per M on shingles was 30¢; on laths, 25¢.

19. Let $x =$ the cost per foot of tubing in dollars

Then, $5x =$ the total cost of the tubing in dollars

and $12x =$ the cost of the pump in dollars

$5x + 12x = 8.50$

$17x = 8.50$; $\therefore x = .50$

$5x = 2.50$, the cost of the tubing in dollars

$12x = 6.00$, the cost of the pump in dollars.

20. Let $x =$ the capacity of each barge in tons

Then, $3\frac{1}{2}x =$ the capacity of each schooner in tons

$3x + 2(3\frac{1}{2}x) = 12{,}000$

$10x = 12{,}000$

$x = 1200$, the capacity of a barge in tons

$3\frac{1}{2}x = 4200$, the capacity of a schooner in tons.

21. Let $x =$ the cost per basket in cents
and $y =$ the cost per box in cents
Then, $100x + 48y = 2168$ (1)
and $100x + 48x = 2168 - 96$ (2)
Solving (2), $x = 14$, the price per basket in cents
Substituting in (1), $1400 + 48y = 2168$
$y = 16$, the price per box in cents.

22. Let $x =$ the number of "clear" days
Then, $x + 6 =$ the number of "cloudy" days
and $x - 4 =$ the number of "partly cloudy" days
$x + x + 6 + x - 4 = 365$
$3x = 365 - 6 + 4 = 363$
$x = 121$, the number of "clear" days
$x + 6 = 127$, the number of "cloudy" days
$x - 4 = 117$, the number of "partly cloudy" days.

23. Let $x =$ the true population
Then, $33.08x =$ the number of dollars in circulation
$33.08x = 36(x - 6{,}895{,}580)$
$33.08x = 36x - 248{,}240{,}880$
$248{,}240.880 = 36x - 33.08x$, or $2.92x$
Dividing by 2.92, $x = 85{,}014{,}000$, the true population.

Page 410

2–7. See Ex. 2–7, pp. 212–214.

Page 411

1–5. See Ex. 1–5, pp. 214–216.

Pages 414–415

1–6. See Ex. 1–6, p. 216.

Pages 417–419

2–20. See Ex. 2–20, pp. 217–219.

Page 421

1–8. See Ex. 1–8, pp. 220–223.

Pages 427–428

1–13. See Ex. 1–13, pp. 223–225.

Pages 431–432

1–24. See Ex. 1–24, pp. 225–227.

Pages 437–440

2–36. See Ex. 2–36, pp. 227–230.

Pages 442–443

1–14. See Ex. 1–14, pp. 230–231.

Page 444

3–19. See Ex. 3–19, pp. 231–233.

Pages 445–447

2–22. See Ex. 2–22, pp. 233–237.

Page 448

2–8. See Ex. 2–8, pp. 237–238.

Pages 449–450

2–11. See Ex. 2–11, pp. 238–240.

Page 452

32. See Ex. 32, p. 240.

Page 455

2–19. See Ex. 2–19, pp. 240–241.

Page 457

3–34. See Ex. 3–34, pp. 242–243.

Pages 459–460

2–43. See Ex. 2–43, pp. 244–248.

2 (§ 649). See Ex. 2, p. 248.

Page 461

3–6. See Ex. 3–6, p. 248.

9–11. See Ex. 9–11, p. 249.

Page 463

1–7. See Ex. 1–7, p. 249.

8. See Ex. 1, p. 250. **10.** See Ex. 3, p. 250. **12.** See Ex. 5, p. 250.
9. See Ex. 2, p. 250. **11.** See Ex. 4, p. 250. **13.** See Ex. 6, p. 250.

Page 464

1–13. See Ex. 1–13, pp. 250–251.

Page 466

1–9. See Ex. 1–9, pp. 251–252.

Page 468

1–4. See Ex. 1–4, p. 252.

Page 469

1–30. See Ex. 1–30, pp. 253–254.

Page 470

1–13. See Ex. 1–13, p. 254.

Page 473

1–4. See Ex. 1–4, pp. 254–255.

Page 474

1–7. See Ex. 1–7, p. 255.

Page 475

1–4. See Ex. 1–4, p. 255.

Page 476

1–5. See Ex. 1–5, pp. 255–256.

Page 477

1–4. See Ex. 1–4, p. 256.

Page 478

5–6. See Ex. 5–6, p. 256. **1–5** (§ **728**). See Ex. 1–5, pp. 256, 257.

Pages 480–481

1–12. See Ex. 1–12, pp. 257–258.

Page 482

1–9. See Ex. 1–9, pp. 259–260.

Pages 483–494

1–110. See Ex. 1–110, pp. 260–270.

Page 495

17.
$$\begin{array}{r|rrr} 3 & 108 & 132 & 156 \\ \hline 4 & 36 & 44 & 52 \\ \hline & 9 & 11 & 13 \end{array}$$
$g.c.d. = 3 \times 4 = 12$

Since the *g.c.d.* of 108, 132, and 156 is 12, the boards can be no longer than 12 ft. to be exactly contained in each of the sides. The length of fence = 108 ft. + 132 ft. + 156 ft. = 396 ft. Since 4 boards are needed for every 12 ft. of fence, as many times 4 boards must be used for 396 ft. of fence as 12 is contained times in 396, that is, 33 × 4 boards, or 132 boards.

Page 498

12.
$$\begin{array}{r|rrrr} 3 & 3 & 4 & 5 & 6 \\ \hline 2 & 1 & 4 & 5 & 2 \\ \hline & 1 & 2 & 5 & 1 \end{array}$$
$3 \times 2 \times 2 \times 5 = 60$

Since the *l.c.m.* of 3, 4, 5, and 6 is 60, the least quantity that can contain each of these measures exactly is 60 qt.

13.
$$\begin{array}{r|rrrr} 5 & 10 & 15 & 27 & 30 \\ \hline 3 & 2 & 3 & 27 & 6 \\ \hline 2 & 2 & 1 & 9 & 2 \\ \hline & 1 & 1 & 9 & 1 \end{array}$$
$5 \times 3 \times 2 \times 9 = 270$

Since the *l.c.m.* of 10, 15, 27, and 30 is 270, the shortest length that can be measured by each of these sticks is 270 in.

14.
$$\begin{array}{r|rr} 3 & 12 & 15 \\ \hline & 4 & 5 \end{array}$$
$3 \times 4 \times 5 = 60$

Since the *l.c.m.* of 12 and 15 is 60, the distance that had been traveled when the rivets were up together for the first time after starting was 60 ft. When the rivets were up together for the 640th time, the carriage had traveled 640 × 60 ft., or 38,400 ft. = $7\frac{3}{11}$ mi.

Page 504

5.
$$\begin{array}{r|l} & 54'872 \;\underline{|\,38} \\ & 27 \\ \hline 2700 & 27872 \\ 720 & \\ \underline{64} & \\ 3484 & \underline{27872} \end{array}$$

6.
$$\begin{array}{r|l} & 175'616 \;\underline{|\,56} \\ & 125 \\ \hline 7500 & 50616 \\ 900 & \\ \underline{36} & \\ 8436 & \underline{50616} \end{array}$$

7.

```
        405'224|74
        343
 14700| 62224
   840|
    16|
 15556| 62224
```

8.

```
        857'375|95
        729
 24300|128375
  1350|
    25|
 25675|128375
```

9.

```
        3'048'625|145
        1
   300|2048
   120|
    16|
   436|1744
      |304625
 58800|
  2100|
    25|
 60925|304625
```

10.

```
         43'614'208|352
         27
   2700|16614
    450|
     25|
   3175|15875
       |739208
 367500|
   2100|
      4|
 369604|739208
```

11.

```
          130'323'843|507
          125
    7500|5323
        |0000
        |5323843
  750000|
   10500|
      49|
  760549|5323843
```

12.

```
           1'865'409'391|1231
           1
     300|865
      60|
       4|
     364|728
        |137409
   43200|
    1080|
       9|
   44289|132867
        |4542391
 4538700|
    3690|
       1|
 4542391|4542391
```

13.

```
           4'065'356'736|1596
           1
     300|3065
     150|
      25|
     475|2375
        |690356
   67500|
    4050|
      81|
   71631|644679
        |45677736
 7584300|
   28620|
      36|
 7612956|45677736
```

14.

```
         95'256'152'263 |4567
         64
     4800|31256
      600|
       25|
     5425|27125
         |4131152
   607500|
     8100|
       36|
   615636|3693816
         |437336263
 62380800|
    95760|
       49|
 62476609|437336263
```

15.

```
          491'916'472'984 |7894
          343
     14700|148916
      1680|
        64|
     16444|131552
          |17364472
   1825200|
     21060|
        81|
   1846341|16617069
          |747403984
 186756300|
     94680|
        16|
 186850996|747403984
```

18.

```
 .000'166'375 |.055
      125
 7500|41375
  750|
   25|
 8275|41375
```

16.

```
         13'312.053 |23.7
          8
   1200 |5312
    180 |
      9 ⎫
   1389 ⎬ |4167
    189 ⎭ |1145053
 158700 |
   4830 |
     49 |
 163579 |1145053
```

17.

```
         28.094'464 |3.04
         27
   2700 |1094
    000 |
      0 ⎫
   2700 ⎬ |0000
    000 ⎭ |1094464
 270000 |
   3600 |
     16 |
 273616 |1094464
```

19.

```
 .000'001'953'125 |.0125
           1
   300 |953
    60 |
     4 ⎫
   364 ⎬ |728
    64 ⎭ |225125
 43200 |
  1800 |
    25 |
 45025 |225125
```

20. 2.000′000′000, etc. |1.2599+

	1
300	1000
60	
4	
364	728
64	272000
43200	
1800	
25	
45025	225125
1825	46875000
4687500	
33750	
81	
4721331	42491979
	43830210
	42491979

21. 6.000′000′000, etc. |1.81712+

	1
300	5000
240	
64	
604	4832
304	168000
97200	
540	
1	
97741	97741
541	70259000
9828300	
38010	
49	
9866359	69064513
	11944870
	9866359
	20785110
	19732718

22. $\frac{4}{9} = .44444$, etc.

.444′444′444, etc. |.7631+

	343
14700	101444
1260	
36	
15996	95976
1296	5468444
1732800	
6840	
9	
1739649	5218947
	2494974
	1739649

$\sqrt[3]{6859} = 19$;

$\sqrt[3]{19683} = 27$;

$\therefore \sqrt[3]{\frac{6859}{19683}} = \frac{19}{27}$.

$\sqrt[3]{166375} = 55$;

$\sqrt[3]{34965783} = 327$;

$\therefore \sqrt[3]{\frac{166375}{34965783}} = \frac{55}{327}$.

Page 505

1. $\sqrt[3]{54,872} = 38$; therefore 38 in. is the depth.

2. $\sqrt[3]{2744} = 14$; hence, the depth of the cistern is 14 ft.

3. $\sqrt[3]{185,193} = 57$; hence, the edge of the cubical block is 57 in.; Then the area of one face = (57 × 57) sq. in. = 3249 sq. in.

4. The box contains $(5\frac{1}{3} \times 4\frac{1}{2} \times 2\frac{2}{3})$ cu. ft., or 64 cu. ft.;
$\sqrt[3]{64} = 4$, the number of feet in the length of one side.

5. 1200 bu. = 1200×2150.42 cu. in., or 2,580,504 cu. in. = 1493.347^+ cu. ft.;
$\sqrt[3]{1493.347^+} = 11.4^+$; therefore, 11.4^+ ft. is the depth of the bin.

6. 400 bbl. = $400 \times 31\frac{1}{2}$ gal., or 12,600 gal. = $12{,}600 \times 231$ cu. in., or 2,910,600 cu. in. = $(2{,}910{,}600 \div 1728)$ cu. ft., or 1684.375 cu. ft.
$\sqrt[3]{1684.375} = 11.9^-$; hence, the cistern is 11.9^- ft. deep.

7. Since the bin is twice as long as it is wide or high, it is equal to two cubical bins each containing 100 bu. of grain.
100 bu. = $100 \times 1\frac{1}{4}$ cu. ft., or 125 cu. ft.;
$\sqrt[3]{125} = 5$, the side of each cubical bin in feet;
2×5 ft. = 10 ft., the length of the bin.

8.
$4 : x = \sqrt[3]{8} : \sqrt[3]{125}$
$4 : x = 2 : 5$
$2x = 20$
$x = 10$, the diameter of the 2d globe in inches.

9.
$18 : x = \sqrt[3]{27} : \sqrt[3]{64}$
$18 : x = 3 : 4$
$3x = 72$
$x = 24$, the diameter of the 2d stack in feet.

10. Since 1 pk. = $\frac{1}{4}$ bu., $\sqrt[3]{1} : \sqrt[3]{\frac{1}{4}} = 18\frac{1}{2} : x$
$1 : .63^- = 18.5 : x$
$x = .63^- \times 18.5$, or 11.65^+, the diameter in inches.
$\sqrt[3]{1} : \sqrt[3]{\frac{1}{4}} = 8 : x$
$1 : .63^- = 8 : x$
$x = .63^- \times 8$, or 5.04 , the depth in inches.

TEXT-BOOKS ON ALGEBRA

By WILLIAM J. MILNE, Ph.D., LL.D., President
New York State Normal College, Albany, N. Y.

ACADEMIC ALGEBRA $1.25

MORE extended and more comprehensive than Milne's High School Algebra, this work not merely states the principles and laws of algebra, but establishes them by rigorous proofs. The student first makes proper inferences, then expresses the inferences briefly and accurately, and finally proves their truth by deductive reasoning. The definitions are very complete, and special applications and devices have been added. The examples are numerous and well graded, and the explanations which accompany the processes, giving a more intelligent insight into the various steps, constitute a valuable feature. The book meets the requirements in algebra for admission to all of the colleges.

ADVANCED ALGEBRA $1.50

THIS book covers fully all college and scientific school entrance requirements in advanced algebra. While the earlier pages are identical with the author's Academic Algebra, more than 160 pages of new matter have been added. Among the new subjects considered are: incommensurable numbers, mathematical induction, probability, simple continued fractions, the theory of numbers, determinants, convergency of series, exponential and logarithmic series, summation of series, and the theory of equations, including graphical representation of functions of one variable, and approximation to incommensurable roots. Over 5,000 unsolved exercises and problems are included in the book. The treatment is full, rigorous, and scientific.

AMERICAN BOOK COMPANY

WEBSTER'S DICTIONARIES

School Editions Revised to Date

PRIMARY SCHOOL DICTIONARY . . . $0.48
Cloth, 12mo, 336 pages. Containing over 20,000 words and meanings, with over 400 illustrations.

COMMON SCHOOL DICTIONARY . . . $0.72
Cloth, 12mo, 432 pages. Containing over 25,000 words and meanings, with over 500 illustrations.

HIGH SCHOOL DICTIONARY $0.98
Cloth, 12mo, 560 pages. Containing about 37,000 words and definitions, with over 800 illustrations.

ACADEMIC DICTIONARY $1.50
Cloth, 8vo, 739 pages. Containing about 60,000 words and definitions, with over 800 illustrations.
Indexed, $1.80.
The same. . . Half calf, $2.75; Indexed, $3.00

WEBSTER'S DICTIONARIES are the acknowledged authority throughout the English-speaking world. They are more widely used in the home, the office, and the schoolroom than all others combined. They constitute a complete and progressive series, carefully graded, and adapted for all classes. The spelling and punctuation in all leading schoolbooks are based on these dictionaries, which are, therefore, a necessity to every teacher.

¶ There have been issued cheap photographic reprints of the old editions of Webster's Dictionaries, and other cheaply made up books fraudulently using the Webster name. These reprints are of editions over fifty years old, and not only are badly printed, but do not contain the words in common use to-day.

¶ The genuine revised Webster's School Dictionaries are distinguished by the circular trade mark which appears on the cover of each, and by the name of the American Book Company on the title page.

AMERICAN BOOK COMPANY